AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0002	13-Nov-2002	W26GLG-2038-3181	5022896

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
CONTRACTING OFFICE (CA/CW) US ARMY ENGR DIST NORFOLK ATTN: CENAO-SS-C 803 FRONT STREET NORFOLK VA 23510-1096	DACA65	**See Item 6**	

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
	X	9A. AMENDMENT OF SOLICITATION NO. DACA65-02-B-0011
	X	9B. DATED (SEE ITEM 11) 07-Oct-2002
		10A. MOD. OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 13)
CODE	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [ ] is extended, [X] is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

AMENDMENT NO. 0002 TO DACA65-02-B-0011, HAZARDOUS WASTE TANKS, RADFORD ARMY AMMUNITION PLANT, RADFORD, VA.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) TEL: EMAIL:	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)	16C. DATE SIGNED 13-Nov-2002

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this modification:

CONTINUATION

Technical plans and specifications are amended. Make appropriate changes in accordance with the attached.

DACA65
CONTRACTING OFFICE (CA/CW)
US ARMY ENGR DIST NORFOLK ATTN:
CENAO-CT 803 FRONT STREET
NORFOLK VA 23510-1096

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

AMENDMENT/MODIFICATION NO.0001

In addition to the referenced amended plans and specs, the following is also included in this amendment.

Item No. 1

Delete reference and specification 02732.

Item No. 2

All welding for NC service including all stainless steel pipe and stainless steel tanks shall meet the Alliant and Hercules standards for NC containing materials.

It is recommended that all welding be accomplished by the TIG process.

All welds will be full penetration and fillet welds are unacceptable and slip-on flanges are also unacceptable.

Delete all references to 304L stainless steel in this contract and include 316L stainless steel.

All piping shall be standard weight 316L stainless steel.

Item No. 3

All underground conduit between tank 3056, 3058 and control building shall be in rigid conduit.

Item No. 4

Soil Borings have been added as Attachment 1 to Section 02221.

Item No. 5

All references to stainless steel liner for manholes in Section 02531 shall be deleted.

DACA65
CONTRACTING OFFICE (CA/CW)
US ARMY ENGR DIST NORFOLK ATTN:
CENAO-CT 803 FRONT STREET
NORFOLK VA 23510-1096

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

AMENDMENT/MODIFICATION NO.0001

PLANS

1. Sheet G0007: At Detail "REMOVABLE HANDRAIL AT GRTG", the note "L or ¼" to suite flange " has been replace with the note "L (F+2-1/2)x2-1/2X1/4X2-1/2" LG F=0.5 x FLANGE WIDTH". See new Amended sheet.
2. Sheet G0013: note 8 added. See new Amended sheet.
3. Sheet G0015: water/cement ratio changed to 0.4 (also on S2501) and steel shapes added to tanks for 316L SS designation. See new Amended sheets.
4. Sheet G0016: Typ Precast Connection @ Slab detail deleted.
5. Sheet A2100: Foundation depth increased to 24".
6. Sheet C2200: Pavement and pad data provided; Note 4 deleted, and third manhole added. See new Amended sheet.
7. Sheet S2103: Detail B correction with Bubble.
8. Sheet S2200: Foundation depth and Sections B & C Bubble corrections.
9. Sheet D2200: Note for cleaning acid brick added. See new Amended sheet.
10. Sheet C2100: Note for road closure. See new Amended sheet.
11. Sheet M2301: Ref Detail 2 shown at the right hand bottom corner…change the 6" x 6" SS TEE" be 6" x 6" SS ELBOW.
12. Sheet G0005: Change pavement base detail to subbase 21A and 3" B6; Note 7 deleted. See new Amended sheet.
13. Sheet S2401: Trench may be cast-in-place concrete. See Amended sheet.
14. Sheet M2600: Pipe PWW-118 insulation changed from Cold to None. . See Amended sheet
15. Sheet M2100: Pipe AS-121 changed from None to Cold. . See Amended sheet
16. Sheet M2200: Dimension corrected. See Amended sheet.
17. Sheet C2201: Dimension correction. See Amended sheet.
18. Sheet M2300: Third manhole added. See Amended sheet.

SECTION TABLE OF CONTENTS

SITE WORK

SECTION 02080

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

-- End of Section Table of Contents --

SECTION 02080

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

PART 1 GENERAL

1.1 SUMMARY

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.2	1979 Fundamentals Governing The Design and Operation of Local Exhaust Systems
ANSI Z88.2	1992 Practices for Respiratory Protection

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 732	1982 (R 1987) Aging Effects of Artificial Weathering on Latex Sealants
ASTM D 522	1988 Mandrel Bend Test of Attached Organic Coatings
ASTM D 1331	1989 Surface and Interfacial Tension of Solutions of Surface-Active Agents
ASTM D 2794	1984 Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 4397	1984 (R 1989) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E 84	1989 (Rev. A) Surface Burning Characteristics of Building Materials
ASTM E 96	1990 Water Vapor Transmission of Materials
ASTM E 119	1988 Fire Tests of Building Construction and Materials
ASTM E 736	1986 Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E 1368	1990 Visual Inspection of Asbestos Abatement Projects

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.134	1988 Respiratory Protection
29 CFR 1910.141	Sanitation
29 CFR 1910.145	Accident Prevention Signs and Tags
29 CFR 1910.1200	1988 Hazard Communications
29 CFR 1926.1101	Asbestos
40 CFR 61, A	General Provisions
40 CFR 61, M	National Emission Standard for Asbestos

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90-018	1990 Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance
EPA 340/1-90-019	1990 Asbestos/NESHAP Adequately Wet Guidance
EPA 560/5-85-024	Guidance for Controlling Asbestos Containing Materials in Buildings

NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH 84-100	3rd Edition NIOSH Manual of Analytical Methods

UNDERWRITERS LABORATORIES INC. (UL)

UL 586	1985 (Rev. 1988) High-Efficiency, Particulate, Air Filter Units

COMMONWEALTH OF VIRGINIA (VA)

VA DOPOR	Virginia Department of Professional and Occupational Regulation: Licensing, (Individuals, Contractors and RFS Contractors) and Training Course Approval
VA DOL&I	Virginia Department of Labor and Industry: Asbestos Project Notifications and Virginia Occupational Safety and Health Enforcement Testing Laboratories
VA APCB	Virginia Air Pollution Control Board: National Environmental Safety and Health Administration Policy Standards

VA DEQ — Virginia Department of Environmental Quality, Waste Division: Disposal of Asbestos Containing Waste Materials, Section 8.1, VR 672-20-10.

1.3 DEFINITIONS

1.3.2 Adequately Wet

A term as defined in 40 CFR 61, M and EPA 340/1-90-019, that means to sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being sufficiently wetted.

1.3.3 Amended Water

Water containing a wetting agent or surfactant with a surface tension of 29 dynes per square centimeter when tested in accordance with ASTM D 1331.

1.3.4 Area Sampling

Sampling of asbestos fiber concentrations within the asbestos control area and outside the asbestos control area which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.3.5 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content is at least one percent of the material by area.

1.3.6 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Examples of asbestos control areas are "outside", "full containment" and "glovebag".

1.3.7 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400, Revision 3, or the OSHA Reference Method (ORM).

1.3.8 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average as defined by 29 CFR 1926.1101 or other federal legislation having legal jurisdiction for the protection of workers health.

1.3.9 Background

Normal airborne asbestos concentration in an area similar to the asbestos abatement area but in an uncontaminated (with asbestos) state.

1.3.10 Contractor

The Contractor is that individual, or entity under contract to the Corps of Engineers to perform the herein listed work.

1.3.11 Encapsulants

Specific materials in various forms used to chemically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

1.3.11.1 Removal Encapsulant

Removal encapsulant can be used as a wetting agent.

1.3.11.2 Bridging Encapsulant

Bridging encapsulant is used to provide a tough, durable surface coating to asbestos containing material.

1.3.11.3 Penetrating Encapsulants

Penetrating encapsulant is used to penetrate the asbestos containing material down to substrate, encapsulating all asbestos fibers.

1.3.11.4 Lock-Down Encapsulant

Lock-Down Encapsulant is used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed.

1.3.12 Friable Asbestos Material

Material that contains more than one percent asbestos by area and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.3.13 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

1.3.14 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.3.15 Corps of Engineer's Industrial Hygienist (CEIH)

That industrial hygienist employed by the Corps of Engineer's to monitor, sample, and/or inspect the work separate from the Contractor's Certified Industrial Hygienist approved for this contract. The CEIH can be either a Federal civil servant or a private consultant as determined by the Corps of Engineers.

1.3.16 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been temporarily locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers will be released under other conditions such as demolition or removal. Under these type conditions, the asbestos containing materials to be removed may be determined by the Contracting Officer to be friable and specified removal operations for friable asbestos removal shall be performed.

1.3.17 Personal Sampling

Air sampling to determine asbestos fiber concentrations within the breathing zone of a specific employee, performed in accordance with 29 CFR 1926.1101.

1.3.18 Certified Industrial Hygienist (CIH)

That industrial hygienist hired by the Contractor to perform the herein listed industrial hygiene tasks.

1.3.19 TEM

Refers to Transmission Electron Microscopy.

1.3.20 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers. At least three full shift samples per person are required to establish that person's TWA exposure.

1.3.21 Wetting Agent

That specific agent used to reduce airborne asbestos levels by physically bonding asbestos fibers to material to be removed. An equivalent wetting agent must have a surface tension of at least 29 dynes per square centimeter as tested in accordance with ASTM D 1331.

1.3.22 Industrial Hygiene Technician (IHT)

The IHT assigned to the site on a full-time basis for the duration of the asbestos abatement of the job, having functional responsibility for implementation and enforcement of the Asbestos Hazard Abatement Plan under the direction of the Contractor's Certified Industrial Hygienist.

1.4 REQUIREMENTS

1.4.1 Description of Work

During initial demolition, the Contractor determine the extent of friable ACM and shall provide a lump sum cost for disposal as a change condition. Preliminary field unsubstantiated analysis indicates mainly non-friable ACM

The work covered by this section includes the handling of asbestos containing materials in the locations indicated and any which may be encountered during this project. This specification describes the minimum procedures and necessary equipment required to protect workers, occupants, the building, and surrounding area from contact with airborne asbestos fibers. The asbestos work includes the demolition, removal and disposal of materials which contain asbestos. Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during demolition and removal operations and therefore must be handled in accordance with the removal and disposal procedures as directed by the CIH in the approved removal plan. Outdoor, full containment and glovebag techniques outlined in this specification are removal methods frequently used for asbestos removal operations of this type, but are not the only methods that may be approved for the scheduled work. The work to be performed will be in accordance with applicable portions of these specifications and as specified in the approved Asbestos Removal Plan.

1.4.2 Medical Requirements

1.4.2.1 Medical Examinations

Before exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101 and State of Virginia directives. This requirement must have been satisfied within the past year. Certified proof of this requirement shall be submitted for approval and an approved copy maintained on file for each employee as required by the State of Virginia and as may be directed by the Contracting Officer. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

1.4.2.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of years as required by the State of Virginia after termination of employment. Make records of the required medical examinations and exposure data available for inspection and copying to: Commissioner, Dept. of Labor & Industry, VA DOL&I, their authorized representatives, and an employee's physician upon the request of the employee or former employee.

1.4.3 Training

Within one year prior to assignment to asbestos work, each employee shall receive instruction from a VA DOPOR approved training course with regard to the hazards of asbestos, safety and health precautions, the use and requirements for protective clothing, equipment, and respirators, and the association of cigarette smoking and asbestos-related disease, and all additional requirements of 29 CFR 1926.1101. Furnish each employee with a respirator fit test administered by the CIH as required by 29 CFR 1926.1101. Fully cover engineering and other hazard control techniques and procedures. In addition, all personnel involved in the asbestos removal on this contract shall be currently licensed in the State of Virginia by the VA DOPOR to perform asbestos removal work. The Contractor shall document and submit for approval the licensing and training data for all employees performing asbestos removal work

by providing dates of training and licensing, training entity, course outline, names of instructors, and qualifications of instructors.

1.4.4 Permits, Licenses, and Notifications

Obtain necessary permits and licenses in conjunction with asbestos removal, hauling, and disposition, and furnish timely notification of such actions required by Federal, state, regional, and local authorities. Notify the VA DOL&I and the Contracting Officer in writing 20 days prior to the commencement of work in accordance with 40 CFR 61, M. Furnish two copies of notification to Contracting Officer.

1.4.5 Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of federal, state, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101, 40 CFR 61, A, 40 CFR 61, M, the revisions through H.B. 803, 1990 to S. 54.1-500 and 54.1-501, Code of Virginia and the Administrative Process Act (S. 9-6.14:1). Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Contracting Officer shall apply.

1.4.6 Respiratory Protection Program

Establish and implement a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

1.4.7 Certified Industrial Hygienist (CIH)

Conduct personal and area/environmental air sampling and training of workers scheduled to perform the work. The Certified Industrial Hygienist (CIH) shall visit the site of the work, be currently certified for comprehensive practice by the American Board of Industrial Hygiene, and licensed in the State of Virginia to perform the scheduled work. For the purpose of this contract, the Contractor shall retain the services of a Certified Industrial Hygienist (CIH) to perform the Contractor's industrial hygiene tasks. The Corps of Engineers reserves the right to retain an industrial hygienist (CEIH) to represent the Contracting Officer and approve all Contractor asbestos removal plans and operations for the government.

1.4.8 Hazard Communication

Adhere to all parts of 29 CFR 1910.1200 and provide the Contracting Officer with a copy of the Material Safety Data Sheets (MSDS) for all materials brought to the site.

1.4.9 Testing

Except as otherwise specified, testing shall comply with NIOSH 84-100.

1.5 SUBMITTALS

Submit the following in accordance with Section 01300 SUBMITTAL DESCRIPTIONS and Section 01305 SUBMITTAL PROCEDURES.

1.5.1 SD-01, Data

Submit data as provided by the manufacturer which describes the products or equipment listed below which are applicable for the work to be performed:

a. Local exhaust equipment GA

b. Vacuums GA

c. Respirators GA

d. Pressure differential automatic recording instrument GA

e. Amended water GA

f. Material Safety Data Sheets (MSDS) for all materials proposed for transport to the project site GA

1.5.2 SD-08, Statements

1.5.2.1 Testing Laboratory GA

Submit the name, address, telephone number, and proof of current licensing by the VA DOPOR of the testing laboratory selected. Include certification verifying persons counting the samples have been judged proficient by successful participation within the last year in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials is required, submit evidence that the laboratory is accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis.

1.5.2.2 Certified Industrial Hygienist (CIH) Certification GA

Submit the name, address, and telephone number of the Certified Industrial Hygienist (CIH) selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training. Include documented evidence that the Certified Industrial Hygienist is currently certified in comprehensive practice by the American Board of Industrial Hygiene, including certification number and date, and is currently licensed in the State of Virginia to perform the work scheduled. Personnel performing any industrial hygiene function under the direction of the CIH shall be employed by the CIH's company and meet all requirements as specified for the work they are to perform.

1.5.2.3 Industrial Hygiene Technician (IHT) GA

Submit name, qualifications and training of the designated IHT. The IHT shall have a minimum of 1 year working experience in the asbestos abatement industry and shall have a sound working knowledge of applicable State and Federal occupational safety and health regulations and formal training in safety and

health. The IHT shall also have demonstrable experience in asbestos air monitoring techniques and respiratory program implementation.

1.5.2.4 Landfill Approval GA

Submit written evidence that the landfill is approved for asbestos disposal by the State of Virginia and all applicable regulatory agency(s). Submit detailed delivery tickets, prepared, signed and dated by an agent of the landfill, certifying the amount of asbestos materials delivered to the landfill, within 3 days after delivery.

1.5.2.5 Employee Training GA

Submit certificates signed by each employee indicating that the employee has received VA DOPOR approved training and is currently licensed in the State of Virginia in the proper handling of materials that contain asbestos; understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis.

1.5.2.6 Medical Certification GA

Provide a written certification signed by a licensed physician and approved by the Certified Industrial Hygienist (CIH) that all workers and supervisors have met or exceeded all of the medical prerequisites listed herein and in 29 CFR 1926.1101 and 29 CFR 1910.134.

1.5.2.7 Notifications GA

Notify the Contracting Officer in writing 20 working days prior to the start of asbestos work.

1.5.2.8 Rental Equipment GA

Provide as required a copy of the written notification to the rental company defining the intended use of the equipment and the possibility of asbestos contamination of the equipment.

1.5.2.9 Respirator Program Records GA

Submit records of the respirator program as required by ANSI Z88.2, 29 CFR 1910.134, 29 CFR 1926.1101.

1.5.2.10 Waste Manifests GA

Submit waste manifests as required.

1.5.3 SD-09, Reports

1.5.3.1 Air Sampling Results GA

Fiber counting shall be completed and results reviewed by the Certified Industrial Hygienist within 24 hours. The CIH shall notify the Contractor and Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. For contract purposes, acceptable limits shall be defined as 0.01 f/cc outside the abatement area, 0.1 f/cc (8 hour TWA) or 1.0 f/cc (30 minute excursion sample) inside the abatement area. Submit sampling results to the Contracting Officer and any affected Contractor employees within 3 working days. Sampling results shall be signed by the Certified Industrial Hygienist or his IHT performing air sampling, the testing laboratory employee that analyzed the sample, the testing laboratory principal and the Contractor.

1.5.3.2 Pressure Differential Recordings for Local Exhaust System GA

Where required by the CIH, provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external of the enclosure and operate it continuously, 24 hours a day, until the enclosure of the asbestos control area is removed. Submit pressure differential recordings for each work day daily to the Contracting Officer. Notify the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance shall levels exceed 0.1 fibers per cubic centimeter.

1.5.4 SD-13, Certificates

Show compliance with ANSI Z9.2 by providing manufacturers' certifications for the following:

a. Vacuums GA

b. Water filtration equipment GA

c. Ventilation systems GA

d. Other equipment required to contain airborne asbestos fibers GA

e. Chemical encapsulants/sealers GA

1.5.5 SD-18, Records

1.5.5.1 Asbestos Hazard Abatement Plan GA

Submit a detailed plan of the safety precautions and work procedures to be used in the removal and demolition of materials containing asbestos. The plan shall be prepared, signed, and sealed, including certification number and date, by the CIH. Such plan shall include but not be limited to the precise personal protective equipment to be used, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control pollution. The plan shall also

include (both fire and medical emergency) response plans. This plan must be approved in writing prior to the start of any asbestos work. The Contractor and CIH shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan shall be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to the start of work.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Shall conform to current USEPA and State of Virginia requirements, shall contain no toxic or hazardous substances, no solvents and shall conform to the following performance requirements.

2.1.1 Removal Encapsulants

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Combustion Toxicity Zero Mortality	University of Pittsburgh Protocol
Life Expectancy - 20 years	ASTM C 732, Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96

2.1.2 Bridging Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Combustion Toxicity Zero Mortality	University of Pittsburgh Protocol
Life Expectancy - 20 years	ASTM C 732, Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96
Cohesion/Adhesion Test - 50 pounds of force/foot	ASTM E 736
Fire Resistance - Negligible affect	ASTM E 119

on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	
Impact Resistance - Minimum 43 in/lb	ASTM D 2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D 522 Mandrel Bend Test

2.1.3 Penetrating Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Combustion Toxicity Zero Mortality	University of Pittsburgh Protocol
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96
Cohesion/Adhesion Test - 50 pounds of force/foot	ASTM E 736
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E 119
Impact Resistance - Minimum 43 in/lb	ASTM D 2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D 522 Mandrel Bend Test

2.1.4 Lock-down Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Combustion Toxicity	University of Pittsburgh

Zero Mortality	Protocol
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E 119
Bond Strength - 100 pounds of force/ foot (Tests compatibility with cementitious and fibrous fire-proofing)	ASTM E 736

2.2 PLASTIC SHEETING

Plastic sheeting shall comply with ASTM D 4397.

PART 3 EXECUTION

3.1 EQUIPMENT

Make available to the Contracting Officer complete sets of personal protective equipment as required herein for each person's entry to the asbestos control area at all times for inspection of the asbestos control area. Provide equivalent training to these persons as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment required to contain airborne asbestos fibers.

3.1.1 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

3.1.1.1 Respirators for Handling Asbestos

Provide personnel engaged in the removal and demolition of asbestos materials with Type C supplied-air respirators, in the pressure/demand mode with an auxiliary self contained breathing apparatus. The use of any other type of respiratory protection must be requested in writing by the CIH. The request shall identify the specific type of respiratory protection requested and the reasoning behind the choice. Forward the request to the Contracting Officer who will provide a written response. A different request shall be filed for each type operation. All respiratory protection shall comply with State of Virginia requirements, 29 CFR 1926.1101 and 29 CFR 1910.134. Use of other than Type C supplied-air respirators, in the pressure/demand mode with an auxiliary, self-contained breathing apparatus is prohibited unless approved by the Contracting Officer.

3.1.2 Exterior Whole Body Protection

3.1.2.1 Protective Clothing

Provide personnel exposed to asbestos with disposable protective whole body clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but shall not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

3.1.2.2 Work Clothing

Provide cloth work clothes for wear under disposable protective coveralls and foot coverings, and either dispose of or properly launder them as recommended by the CIH after use.

3.1.2.3 Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and a clean locker room with a shower that complies with 29 CFR 1910.141(d)(3) in between for personnel required to wear whole body protective clothing. Provide two separate lockers for each asbestos worker, one in each locker room. Keep street clothing and street shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter to remove asbestos contamination with an approved water filtration equipment. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste. Decontamination units shall be physically attached to the asbestos control area. Build both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.2.4 Eye Protection

Provide goggles to personnel engaged in asbestos operations when the use of a full face respirator is not required.

3.1.3 Warning Signs and Labels

Provide warning signs at all approaches to asbestos control areas containing concentrations of airborne asbestos fibers. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos.

3.1.3.1 Warning Sign

Provide vertical format conforming to 29 CFR 1910.145(d)(4), and 29 CFR 1926.1101 minimum 20 by 14 inches displaying the following legend in the lower panel:

Legend	Notation
Danger	1-inch Sans Serif Gothic or Block
Asbestos	1-inch Sans Serif Gothic or Block
Cancer and Lung Disease Hazard	1/4-inch Sans Serif Gothic or Block
Authorized Personnel Only	1/4-inch Gothic
Respirators and Protective Clothing are Required in this Area	1/4-inch Gothic

Spacing between lines shall be at least equal to the height of the upper of any two lines.

3.1.3.2 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

BREATHING ASBESTOS DUST MAY
CAUSE SERIOUS BODILY HARM

3.1.4 Local Exhaust System

Provide a local exhaust system in the asbestos control area in accordance with ANSI Z9.2 and 29 CFR 1926.1101 that will provide at least four air changes per hour inside of the containment. Local exhaust shall be operated 24 hours per day, until the asbestos control area is removed and shall be leak proof to the filter and equipped with HEPA filters. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. In no case shall the building ventilation system be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment shall conform to ANSI Z9.2 and UL 586. The local exhaust system shall terminate to the outside.

3.1.5 Tools

Vacuums shall be leak proof to the filter and equipped with HEPA filters. Filters on vacuums shall conform to ANSI Z9.2 and UL 586. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation systems. Remove all residual asbestos from reusable tools prior to storage or reuse.

3.1.6 Rental Equipment

If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

3.2 WORK PROCEDURE

Perform asbestos related work in accordance with 29 CFR 1926.1101 and as specified herein. Use removal procedures as directed by the CIH. Personnel shall wear and utilize protective clothing and equipment as specified herein. Eating, smoking, drinking, or applying cosmetics shall not be permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal and demolition of asbestos shall not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection provisions of this specification are complied with by the trade personnel. Shut down the building heating, ventilating, and air conditioning system, cap the openings to the system, and provide temporary heating, ventilating and air conditioning prior to the commencement of asbestos work. If an asbestos spill occurs outside of the asbestos control area, stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 Protection of Existing Work to Remain

Perform demolition work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the CIH, work may proceed. Unprotected areas located immediately below or adjacent to asbestos control areas shall be protected by covering with a 6-mil layer of plastic sheeting or other approve method as directed by the CIH. The areas to protect shall include but not be limited to unprotected stock and furnishings, plantings and shrubs, equipment and loading dock areas where roofing debris is likely to be deposited.

3.2.2 Furnishings

Furniture, stored goods and equipment to remain in the asbestos control area shall be covered and sealed with 6-mil plastic sheet or, when feasible, removed from the work area and stored in a location on site approved by the Contracting Officer.

3.2.3 Precleaning

Wet wipe and HEPA vacuum all surfaces with asbestos debris prior to establishment of a containment.

3.2.4 Asbestos Control Area Requirements

3.2.4.1 Full Containment

Block and seal openings in areas where the release of airborne asbestos fibers can be expected. Establish an asbestos containment with the use of curtains, portable partitions, or other enclosures as directed by the CIH in order to prevent the escape of asbestos fibers from the contaminated asbestos work area. Containment development shall include, as a minimum, protective covering of walls, and ceilings with a continuous membrane of two layers of minimum 4-mil plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 6-mil plastic sheet over floors and extend a minimum of 12 inches up walls. Seal all joints with tape. Provide local exhaust system in the asbestos control area. Openings will be allowed in enclosures of asbestos control areas for the supply and exhaust of air for the local exhaust system. Replace filters as required to maintain the efficiency of the system.

3.2.4.2 Glovebag

The construction of an enclosed asbestos containment is infeasible for the removal of the asbestos indicated. Use glovebag techniques as indicated in 29 CFR 1926.1101. Establish designated limits for the asbestos work area with the use of rope or other continuous barriers, maintain all other requirements for asbestos control areas except for local exhaust. Also, where an enclosure is not provided, conduct area monitoring of airborne asbestos fibers during the work shift at the designated limits of the asbestos work area at such frequency as directed by the CIH and conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work). If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter whichever is lesser, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the government at the discretion of the Contracting Officer. If the air sampling results obtained by the government differ from those obtained by the Contractor, the government results shall prevail. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

3.2.4.3 Outdoor

The construction of an enclosed asbestos containment is infeasible for the removal of the asbestos indicated. Establish designated limits for the asbestos work area with the use of rope or other continuous barriers, and maintain all other requirements for asbestos control areas except for local exhaust. Also, where an enclosure is not provided, conduct area monitoring of airborne asbestos fibers during the work shift at the designated limits of the asbestos work area at such frequency and locations as directed by the CIH and conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work). If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter whichever is lesser, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those obtained by the Contractor, the Government results shall prevail. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

3.2.5 Asbestos Handling Procedures

3.2.5.1 General Procedures

Wet asbestos material with a fine spray of approved wetting agent during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 6 mil plastic disposal bags. Where unusual circumstances prohibit the use of 6 mil plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation and wrap the pipes and insulation in plastic and remove the pipe by sections.

3.2.5.2 Sealing Contaminated Items Designated for Disposal

Remove contaminated architectural, mechanical, and electrical appurtenances such as pipes and fittings, panels, and other contaminated items designated for removal by completely coating the items with an approved asbestos lockdown encapsulant at the demolition site before removing the items from the asbestos control area. These items need not be vacuumed. The asbestos lockdown encapsulant shall be tinted a contrasting color. It shall be spray-applied by airless method. Thoroughness of sealing operation shall be visually gauged by the extent of colored coating on exposed surfaces. Lockdown encapsulants shall comply with the performance requirements specified herein.

3.2.6 Air Sampling

Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the CIH. Sampling performed for environmental and quality control reasons shall be performed by the CIH. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government results shall prevail.

3.2.6.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each demolition and removal site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.6.2 Sampling During Asbestos Work

The CIH shall provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. Thereafter, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the containment, outside the clean room entrance to the containment, and at the exhaust opening of the local exhaust system. If sampling outside the containment shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. In areas where the construction of a containment is not required, after initial TWAs are established and provided the same type of work is being performed, provide sampling at the designated limits of the asbestos work area at such frequency as recommended by the CIH.

Perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels.

3.2.6.3 Sampling After Final Clean-Up (Clearance Sampling)

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and as required to establish an airborne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the containment or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the CIH shall perform a visual inspection in accordance with ASTM E 1368 to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Perform samples in quantities as directed by the CIH. Analyze clearance samples and report the results in accordance with current NIOSH criteria. The asbestos fiber counts from these samples shall be less than 0.01 fibers per cubic centimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and perform TEM analysis at the Contractor's expense, until the affected area is demonstrated to contain less than 70 asbestos structures per square millimeter and has been certified as clean of asbestos fibers by the CIH.

3.2.7 Lock Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, a visual inspection by the CIH, of all areas affected by the removal of the asbestos contaminated materials for any visible fibers, shall be conducted and approved by the CIH. A post removal (lock down) encapsulant shall then be spray applied to ceiling, walls, floors and other areas exposed in the removal area. The exposed area shall include but not be limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decontamination chambers.

3.2.8 Site Inspection

While performing asbestos removal work, the Contractor shall be subject to on-site inspection by the Contracting Officer. If the work is found to be in violation of this specification, the Contracting Officer will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time required to resolve the violation shall be at the Contractor's expense.

3.3 CLEAN-UP AND DISPOSAL

3.3.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. Do not blow down the space with compressed air. When asbestos removal is complete, all asbestos waste is removed from the work-site, and final clean-up is completed, the Contracting Officer will certify the area as safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the containment removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos-contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The Contracting Officer will visually inspect all surfaces within the

containment for residual material or accumulated dust or debris. The Contractor shall re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The Contracting Officer will certify in writing that the area is safe before unrestricted entry is permitted. The Government reserves the option to perform monitoring to certify the areas are safe before entry is permitted.

3.3.2 Title to Materials

All materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor upon receipt of notice to proceed and shall be disposed of as specified in applicable local, state, and Federal regulations and as specified herein.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiberproof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be wetted to insure the security of the material in case of container breeching. Affix a warning and Department of Transportation (DOT) label to each bag or use at least 6 mil thick bags with the approved warnings and DOT labeling preprinted on the bag. Dispose of waste asbestos material at a VA DEQ approved asbestos landfill off Government property. For temporary storage, store sealed impermeable bags in asbestos waste drums. An area for interim storage of asbestos waste-containing drums will be assigned by the Contracting Officer. Procedure for hauling and disposal shall comply with 40 CFR 61, M, state, regional, and local standards. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags shall remain in the drum and the entire contaminated drum shall be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums shall wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

3.3.3.2 Nonregulated Waste Disposal

For disposal of nonregulated, Category I and Category II , nonfriable asbestos containing materials, the Contractor shall submit a notarized statement that the proposed disposal facility has been apprised of the fact that debris from this project includes nonfriable asbestos containing materials. The statement shall also include evidence that the landfill provides adequate daily cover and operates in full compliance with all applicable Federal, State, and local regulations.

3.3.3.3 Asbestos Disposal Quantity Report

The CIH shall record and submit to the Contracting Officer the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day's shift with amounts of material removed during the previous day reported in linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal. The government reserves the right to inspect and record the amount of asbestos containing material removed and released for disposal on a daily basis.

-- End of Section --

SECTION 05093A

WELDING PRESSURE PIPING AND ACID GRAVITY PIPING
09/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT RP SNT-TC-1A	(1996) Recommended Practice SNT-TC-1A
ASNT Q&A Bk A	(1996) Question and Answer Book A: Radiographic Test Method; Levels I, II, III (Supplement to Recommended Practice SNT-TC-1A)
ASNT RP SNT-TC-1A Bk B	(1994) Question and Answers Levels I, II, and III Magnetic Particle Method Book B (Supplement to RP SNT-TC-1A)
ASNT Q&A Bk C	(1994) Question and Answer Book C: Ultrasonic Testing Method; Levels I, II, III (Supplement to RP SNT-TC-1A
ASNT Q&A Bk D	(1996) Question and Answer Book D: Liquid Penetrant Testing Method; Levels I, II, III (Supplement to RP SNT-TC-1A)

ASME INTERNATIONAL (ASME)

ASME B31.1	(1998) Power Piping
ASME B31.3	(1999) Process Piping
ASME BPVC SEC I	(1998) Boiler and Pressure Vessel Code; Section I, Power Boilers
ASME BPVC SEC II-C	(1998) Boiler and Pressure Vessel Code; Section II, Materials, Part C - Specifications for Welding Rods, Electrodes and Filler Metals
ASME BPVC SEC V	(1998) Boiler and Pressure Vessel Code; Section V, Nondestructive Examination

ASME BPVC SEC IX	(1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1998) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A3.0	(1994) Standard Welding Terms and Definitions
AWS B2.1	(1998) Welding Procedure and Performance Qualification
AWS QC1	(1996) AWS Certification of Welding Inspectors
AWS Z49.1	(1999) Safety in Welding and Cutting and Allied Processes

1.2 DEFINITIONS

Definitions shall be in accordance with AWS A3.0. Note that in Attachment I, all references to Hercules implies Alliant-Tech Systems (ATK).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Pressure Piping and Acid Gravity Piping; G, SWAO

Detail drawings showing location, length, and type of welds; and indicating postweld heat treatment and NDE as required.

SD-03 Product Data

Qualifications; G, SWAO

Welding procedure qualification.

Welding Operations; G, SWAO

Detailed procedures which define methods of compliance to contract drawings and specifications. Inspection and material procurement records. System and material testing and certification records. Written records and drawings indicating location of welds made by each welder or welding operator.

SD-07 Certificates

Qualifications; G, SWAO

Welder and welding operator performance qualification certificates. Welding inspectors and NDE personnel certificates. Qualifications of testing laboratory or the Contractor's quality assurance organization.

1.4 GENERAL REQUIREMENTS

This section covers the welding of pressure piping systems. Deviations from applicable codes, approved procedures, and approved detail drawings will not be permitted without prior written approval. Materials or components with welds made offsite will not be accepted if the welding does not conform to the requirements of this specification, unless otherwise specified. Procedures shall be developed by the Contractor for welding all metals included in the work. Welding shall not be started until welding procedures, welders, and welding operators have been qualified. Qualification testing shall be performed by an approved testing laboratory, or by the Contractor if approved by the Contracting Officer. Costs of such testing shall be borne by the Contractor. The Contracting Officer shall be notified at least 24 hours in advance of the time and place of the tests. When practicable, the qualification tests shall be performed at or near the worksite. The Contractor shall maintain current records of the test results obtained in the welding procedure, welding operator, welder performance qualifications, and nondestructive examination (NDE) procedures readily available at the site for examination by the Contracting Officer. The procedures for making transition welds between different materials or between plates or pipes of different wall thicknesses shall be qualified. ASME B31.1 ASME B31.3 requirements for branch connections may be used in lieu of detailed designs. Unless otherwise specified, the choice of welding process shall be the responsibility of the Contractor.

Welding and Fabrication Requirements Class Nitrocellulose (NC) piping - fabrication, erection, and testing requirement, i.e., acid waste process and gravity piping, shall be in accordance with Attachment I.

1.5 PERFORMANCE

The Contractor shall be responsible for the quality of all joint preparation, welding, and examination. All materials used in the welding operations shall be clearly identified and recorded. The inspection and testing defined in this specification are minimum requirements. Additional inspection and testing shall be the responsibility of the Contractor when he deems it necessary to achieve the quality required.

1.6 QUALIFICATIONS

Welding procedures, welders, and welding operators previously qualified by test may be accepted for the work without requalification, provided that all of the following conditions are fulfilled:

a. Copies of the welding procedures, the procedure qualification test records, and the welder and welding operator performance qualification test records are submitted and approved in accordance with paragraph SUBMITTALS.

b. Testing was performed by an approved testing laboratory or technical consultant or by the Contractor's approved quality assurance organization.

c. The welding procedures, welders, and welding operators were qualified in accordance with ASME BPVC SEC IX, or AWS B2.1, AR-2 level; and base materials, filler materials, electrodes, equipment, and processes conformed to the applicable requirements of this specification.

d. The requirements of paragraph "Renewal of Qualification" below are met and records showing name of employer and period of employment using the process for which qualified are submitted as evidence of conformance.

1.6.1 Welding Procedures Qualification

The Contractor shall record in detail and shall qualify the Welding Procedure Specifications for every proposed welding procedure. Qualification for each welding procedure shall conform to the requirements of ASME B31.1 and ASME B31.3 and to this specification. The welding procedures shall specify end preparation for butt welds including cleaning, alignment, and root openings. Preheat, interpass temperature control, and postheat treatment of welds shall be as required by approved welding procedures, unless otherwise indicated or specified. The type of backing rings or consumable inserts, if used, shall be described and if they are to be removed, the removal process shall be described. Copies of the welding procedure specifications and procedure qualification test results for each type of welding required shall be submitted in accordance with paragraph SUBMITTALS. Approval of any procedure does not relieve the Contractor of the sole responsibility for producing acceptable welds. Welding procedures shall be identified individually and shall be referenced on the detail drawings or keyed to the contract drawings.

1.6.2 Welder and Welding Operator Performance

Each welder and welding operator assigned to work shall be qualified in accordance with ASME B31.1 and ASME B31.3.

1.6.2.1 Certification

Before assigning welders or welding operators to the work, the Contractor shall provide the Contracting Officer with their names together with certification that each individual is performance-qualified as specified. The certification shall state the type of welding and positions for which each is qualified, the code and procedure under which each is qualified, date qualified, and the firm and individual certifying the qualification tests.

1.6.2.2 Identification

Each particular weld shall be identified with the personal number, letter, or symbol assigned to each welder or welding operator. To identify welds, written records indicating the location of welds made by each welder or welding operator shall be submitted, and each welder or welding operator shall apply the personal mark adjacent to the welds using a rubber stamp or felt-tipped marker with permanent, weatherproof ink or other methods approved by the Contracting Officer that do not deform the metal. For seam welds, identification marks shall be placed adjacent to the welds at 3 foot intervals. Identification by die stamps or electric etchers will not be allowed.

1.6.2.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

a. When a welder or welding operator has not used the specific welding process for a period of 3 months; the period may be extended to 6 months if the welder or welding operator has been employed on some other welding process.

b. When a welder or welding operator has not welded with any process during a period of 3 months, all the personal qualifications shall be considered expired, including any extended by virtue of a., above.

c. There is specific reason to question the person's ability to make welds that will meet the requirements of the specifications.

d. The welder or welding operator was qualified by an employer, other than those firms performing work under this contract, and a qualification test has not been taken within the preceding 12 months.

e. Renewal of qualification for a specific welding process under conditions a., b., and d., above, needs to be made on only a single test joint or pipe of any thickness, position, or material to reestablish the welder's or welding operator's qualification for any thickness, position, or material covered under previous qualification.

1.6.3 Inspection and NDE Personnel

All inspection and NDE personnel shall be qualified in accordance with the following requirements.

1.6.3.1 Inspector Certification

Welding inspectors shall be qualified in accordance with AWS QC1.

1.6.3.2 NDE Personnel

NDE personnel shall be certified, and a written procedure for the control and administration of NDE personnel training, examination, and certification shall be established. The procedures shall be based on appropriate specific and general guidelines of training and experience recommended by ASNT RP SNT-TC-1A, ASNT Q&A Bk A ASNT RP SNT-TC-1A Bk B ASNT Q&A Bk C and ASNT Q&A Bk D.

1.7 DELIVERY, STORAGE, AND HANDLING

All filler metals, electrodes, fluxes, and other welding materials shall be delivered to the site in manufacturers' original packages and stored in a dry space until used. Packages shall be properly labeled and designed to give maximum protection from moisture and to insure safe handling.

1.7.1 Material Control

Materials shall be stored in a controlled access and clean, dry area that is weathertight and is maintained at a temperature recommended by the manufacturer. The materials shall not be in contact with the floor and shall be stored on wooden pallets or cribbing.

1.7.1.1 Damaged Containers

Low-hydrogen steel electrodes shall be stored in their sealed shipping container. If the seal is damaged during shipment or storage, and the damage is not immediately detected, the covered electrodes in that container shall be rebaked in accordance with the manufacturer's instructions prior to issuance or shall be discarded. If a container is damaged in storage and the damage is witnessed, the electrodes from that container shall be immediately placed in a storage oven. The storage oven temperature shall be as recommended by the manufacturer or the welding material specification.

1.7.1.2 Partial Issues

When a container of covered electrodes is opened and only a portion of the content is issued, the remaining portion shall, within 1/2 hour, be placed in a storage oven.

1.7.2 Damaged Materials

Materials which are damaged shall be discarded. Covered electrodes which are oil or water-soaked, dirty, or on which the flux has separated from the wire shall be discarded.

1.8 SYMBOLS

Symbols shall be in accordance with AWS A2.4.

1.9 SAFETY

Safety precautions shall conform to AWS Z49.1.

PART 2 PRODUCTS

2.1 WELDING MATERIALS

Welding materials shall comply with ASME BPVC SEC II-C. Welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator using qualified welding procedures.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

Welding shall be performed in accordance with qualified procedures using qualified welders and welding operators. Welding shall not be done when the quality of the completed weld could be impaired by the prevailing working or weather conditions. The Contracting Officer shall determine when weather or working conditions are unsuitable for welding. Welding of hangers, supports, and plates to structural members shall conform to Section 05055 WELDING, STRUCTURAL.

3.1.1 Base Metal Preparation

Oxy-fuel cutting shall not be used on austenitic stainless steel or nonferrous materials.

3.1.2 Weld Joint Fit-Up

Parts that are to be joined by welding shall be fitted, aligned, and retained in position during the welding operation by the use of bars, jacks, clamps, or other mechanical fixtures. Welded temporary attachments shall not be used except when it is impractical to use mechanical fixtures. When temporary attachments are used, they shall be the same material as the base metal, and shall be completely removed by grinding or thermal cutting after the welding operation is completed. If thermal cutting is used, the attachment shall be cut to not less than 1/4 inch from the member and the balance removed by grinding. After the temporary attachment has been removed, the area shall be visually examined.

3.1.3 Preheat and Interpass Temperatures

Preheat temperatures shall meet the requirements specified by ASME B31.1 and ASME B31.3. However, in no case shall the preheat be below 50 degrees F for ferritic steel or austenitic stainless steel, or 32 degrees F for nonferrous alloys. The maximum interpass temperatures shall not exceed 300 degrees F for austenitic stainless steels, nickel alloys, and copper alloys; and 500 degrees F for carbon steels. Preheat techniques shall be such as to ensure that the full thickness of the weld joint preparation and/or adjacent base material, at least 3 inches in all directions, is at the specified temperature. Preheating by induction or resistance methods is preferred. When flame heating is used, only a neutral flame shall be employed. Oxy-fuel heating shall not be used on austenitic stainless steel or nickel-alloy materials; however, air-fuel heating is acceptable if controlled to insure that the surface temperature does not exceed 150 degrees F. Interpass temperatures shall be checked on the surface of the

component within 1 inch of the weld groove and at the starting location of the next weld pass, and for a distance of about 6 inches ahead of the weld, but not on the area to be welded.

3.1.4 Production Welding Instructions

a. Welding shall not be done when the ambient temperature is lower than 0 degree F.

b. Welding is not permitted on surfaces that are wet or covered with ice, when snow or rain is falling on the surfaces to be welded, or during periods of high winds, unless the welders and the work are properly protected.

c. Gases for purging and shielding shall be welding grade and shall have a dew point of minus 40 degrees F or lower.

d. Back purges are required for austenitic stainless steels and nonferrous alloys welded from one side and shall be set up such that the flow of gas from the inlet to the outlet orifice passes across the area to be welded. The oxygen content of the gas exiting from the purge vent shall be less than 2 percent prior to welding.

e. The purge on groove welds shall be maintained for at least three layers or 3/16 inch.

f. Removable purge dam materials shall be made of expandable or flexible plugs, such as plexiglass, plywood (which shall be dry when used), etc. Wood dams shall be kiln-dried quality. Nonremovable purge dams and purge dam adhesives shall be made of water soluble materials. Purge dams shall not be made of polyvinyl alcohol.

g. Any welding process which requires the use of external gas shielding shall not be done in a draft or wind unless the weld area is protected by a shelter. This shelter shall be of material and shape appropriate to reduce wind velocity in the vicinity of the weld to a maximum of 5 mph (440 fpm).

h. Welding of low-alloy and hardenable high-alloy steels may be interrupted provided a minimum of at least 3/8 inch thickness of weld deposit or 25 percent of the weld groove is filled, whichever is greater, and the preheat temperature is maintained during the time that welding is interrupted. If the temperature falls below the minimum preheat temperature before all welding has been completed on a joint, or, where required, before post weld heat treatment, a liquid penetrant or magnetic particle examination shall be performed to insure sound deposited metal before reheating. Welding of other materials may be interrupted without restriction provided a visual inspection is performed before welding is resumed.

i. Tack welds to be incorporated in the final welds shall have their

ends tapered by grinding or welding technique. Tack welds that are cracked or defective shall be removed and the groove shall be retacked prior to welding. Temporary tack welds shall be removed, the surface ground smooth, and visually inspected. For low-alloy and hardenable high-alloy steels, the area shall be magnetic particle examination inspected.

j. When joining ferritic steel pressure piping components to austenitic stainless steel pressure piping components and postweld heat treatment is required, the following requirements apply:

(1) The weld-end preps of ferritic steel components, which are to be welded to austenitic stainless steel, shall be buttered with one of the following weld filler metals and shall conform to the specified requirements:

ASME BPVC SEC II-C, SFA 5.14, Classification ERNiCr-3.

ASME BPVC SEC II-C, SFA 5.11, Classification ENiCrFe-2.

(2) The ferritic steel weld-end prep shall be buttered, receive a postweld heat treatment as required by ASME B31.1 and ASME B31.3 and then be machined with the applicable weld-end preparation. After machining, the buttered layer shall be a minimum of 1/4 inch thick.

(3) Pressure piping transition joints shall be completed using ERNiCr-3 or ENiCrFe-2 weld filler metals. No further postweld heat treatment shall be performed.

k. When joining ferritic steel pressure piping components to austenitic stainless steel pressure piping components and postweld heat treatment is not required, prepare and weld the joint using either ERNiCr-3 or ENiCrFe-2 filler metals. For service temperatures of 200 degrees F or less, stainless filler metal 309 ASME BPVC SEC II-C, SFA 5.4 or 5.9 is permissible in lieu of the nickel-based alloys.

l. Grinding of completed welds is to be performed only to the extent required for NDE, including any inservice examination, and to provide weld reinforcement within the requirements of ASME B31.1 and ASME B31.3. If the surface of the weld requires grinding, reducing the weld or base material below the minimum required thickness shall be avoided. Minimum weld external reinforcement shall be flush between external surfaces.

3.1.5 Postweld Heat Treatment

Postweld heat treatment shall be performed in accordance with ASME B31.1 and ASME B31.3. Temperatures for local postweld heat treatment shall be measured continuously by thermocouples in contact with the weldment.

Postweld heat treatment of low-alloy steels, when required, shall be performed immediately upon completion of welding and prior to the

temperature of the weld falling below the preheat temperature. However, postweld heat treatment may be postponed after the completion of the weld, if, immediately after the weld is completed, it is maintained at a minimum temperature of 300 degrees F or the preheat temperature, whichever is greater, for 2 hours per inch of weld thickness.

For low-alloy steels, the cooling rates shall be such that temper embrittlement is avoided.

3.2 EXAMINATIONS, INSPECTIONS, AND TESTS

Visual and NDE shall be performed by the Contractor to detect surface and internal discontinuities in completed welds. The services of a qualified commercial inspection or testing laboratory or technical consultant, approved by the Contracting Officer, shall be employed by the Contractor. All tack welds, weld passes, and completed welds shall be visually inspected. In addition, liquid penetrant examination shall be performed on root passes. Visual, magnetic particle or Ultrasonic examination shall be required as indicated in ATTACHMENT I. When inspection and testing indicates defects in a weld joint, the weld shall be repaired by a qualified welder in accordance with paragraph CORRECTIONS AND REPAIRS.

3.2.1 Random NDE Testing

Random radiographic and liquid penetrant examination is required, the Contractor shall test a minimum of 5 percent of the total length or number of piping welds. The welds inspected shall be selected randomly, but the selection shall include an examination of welds made by each welding operator or welder. If the random testing reveals that any welds fail to meet minimum quality requirements, an additional 10 percent of the welds in that same group shall be inspected. If all of the additional welds inspected meet the quality requirements, the entire group of welds represented shall be accepted and the defective welds shall be repaired. If any of the additional welds inspected also fail to meet the quality requirements, that entire group of welds shall be rejected. The rejected welds shall be removed and rewelded, or the rejected welds shall be 100 percent inspected and all defective weld areas removed and rewelded.

3.2.2 Visual Inspection

Weld joints shall be inspected visually as follows:

a. Before welding - for compliance with requirements for joint preparation, placement of backing rings or consumable inserts, alignment and fit-up, and cleanliness.

b. During welding - for cracks and conformance to the qualified welding procedure.

c. After welding - for cracks, contour and finish, bead reinforcement, undercutting, overlap, and size of fillet welds.

3.2.3 NDE Testing

NDE shall be in accordance with written procedures. Procedures for radiographic liquid penetrant tests and methods shall conform to ASME BPVC SEC V. The approved procedure shall be demonstrated to the satisfaction of the Contracting Officer. In addition to the information required in ASME BPVC SEC V, the written procedures shall include the timing of the NDE in relation to the welding operations and safety precautions.

3.2.4 Inspection and Tests by the Government

The Government will perform inspection and supplemental nondestructive or destructive tests as deemed necessary. The cost of supplemental NDE will be borne by the Government. The correction and repair of defects and the reexamination of weld repairs shall be performed by the Contractor at no additional cost to the Government. Inspection and tests will be performed as required for visual inspection and NDE, except that destructive tests may be required also. When destructive tests are ordered by the Contracting Officer and performed by the Contractor and the specimens or other supplemental examinations indicate that the materials and workmanship do not conform to the contract requirements, the cost of the tests, corrections, and repairs shall be borne by the Contractor. When the specimens or other supplemental examinations of destructive tests indicate that materials or workmanship do conform to the specification requirements, the cost of the tests and repairs will be borne by the Government. When destructive tests are made, repairs shall be made by qualified welders or welding operators using welding procedures which will develop the full strength of the members cut. Welding shall be subject to inspection and tests in the mill, shop, and field. When materials or workmanship do not conform to the specification requirements, the work may be rejected at any time before final acceptance of the system containing the weldment.

3.3 ACCEPTANCE STANDARDS

3.3.1 Visual

The following indications are unacceptable:

a. Cracks.

b. Undercut on surface which is greater than 1/32 inchdeep.

c. Weld reinforcement greater than 3/16 inch.

d. Lack of fusion on surface.

e. Incomplete penetration (applies only when inside surface is readily accessible).

f. Concavity in groove welds.

3.3.2 Liquid Penetrant Examination

The following relevant indications are unacceptable:

a. Any cracks or linear indications.

b. Four or more rounded indications in a line separated by 1/16 inch or less edge-to-edge.

3.3.3 Radiography

Welds that are shown by radiography to have any of the following discontinuities are unacceptable:

a. Porosity in excess of that shown as acceptable in ASME BPVC SEC I, Appendix A-250.

b. Any type of crack or zone of incomplete fusion or penetration.

c. Any other elongated indication which has a length greater than:

(1) 1/4 inch for t up to 3/4 inchinclusive, where t is the thickness of the thinner portion of the weld.

(2) 1/3 t for t from 3/4 inch to 2-1/4 inch, inclusive.

(3) 3/4 inch for t over 2-1/4 inch.

d. Any group of indications in line that have an aggregate length greater than t in a length of 12t, except where the distance between the successive indications exceeds 6L where L is the longest indication in the group.

Where t pertains to the thickness of the weld being examined; if a weld joins two members having different thickness at the weld, t is the thinner of these two thicknesses.

3.3.4 Ultrasonic Examination

Linear-type discontinuities are unacceptable if the amplitude exceeds the reference level and discontinuities have lengths which exceed the following:

a. 1/4 inch for t up to 3/4 inch.

b. 1/3 inch for t from3/4 to 2-1/4 inch.

c. 3/4 inch for t over 2-1/4 inch.

Where t is the thickness of the weld being examined; if the weld joins two members having different thicknesses at the weld, t is the thinner of these two thicknesses. Where discontinuities are interpreted to be cracks, lack of fusion, and incomplete penetration, they are unacceptable regardless of length.

3.4 CORRECTIONS AND REPAIRS

Defects shall be removed and repaired as specified in ASME B31.1 and ASME B31.3 unless otherwise specified. Disqualifying defects discovered between weld passes shall be repaired before additional weld material is deposited.

Wherever a defect is removed, and repair by welding is not required, the affected area shall be blended into the surrounding surface eliminating sharp notches, crevices, or corners. After defect removal is complete and before rewelding, the area shall be examined by the same test method which first revealed the defect to ensure that the defect has been eliminated. After rewelding, the repaired area shall be reexamined by the same test method originally used for that area. Any indication of a defect shall be regarded as a defect unless reevaluation by NDE or by surface conditioning shows that no disqualifying defects are present. The use of any foreign material to mask, fill in, seal, or disguise welding defects will not be permitted.

-- End of Section --

ATTACHMENT I

Class Nitrocellulose (NC) and Acid Gravity Piping (Hercules N0.3947s and 14C5-15500 - PIPING Fabrication, Erection, and Testing Requirements)

CLASS NITROCELLULOSE (NC) - PIPING - FABRICATION, ERECTION, AND TESTING REQUIREMENTS

Note: Except where otherwise specified, all references to paragraph numbers (eg 6.2.3) refer to paragraphs of this drawing

1.0 General Requirements for Ferrous and Non-Ferrous Construction and Repairs

1.1 Requirements listed herein are minimum standards and shall not have preference over any specification as stated on Hercules Incorporated approved drawings.

1.2 All Design, Materials, Fabrication, Assembly and Erection, Examination, Inspection, and Testing shall meet the minimum requirements of the latest applicable edition of the American Society of Mechanical Engineers (ASME/ANSI) B31.3 Chemical Plant and Petroleum Refining Piping Code (hereafter referred to as the B31.3 Code), and its mandatory references.

1.2.1 Minimum Design Category

1.2.1.1 The minimum design category for NC fluid service at less than 4% acid content and meeting the temperature/pressure/nonflammable limitations criteria as stated in the definition of "Category D fluid service", paragraph 300.2 of the B31.3 Code, shall be Category D. Additionally, more stringent Hercules Incorporated workmanship, examination and inspection requirements that apply are stated below.

1.2.1.2 The minimum design category for fluid service at 4% acid content or greater and/or experiencing pressures or temperatures above that for Category "D", or defined as being flammable, as defined by paragraph 300.2 of the B31.3 Code, is the implicit "Normal Service Condition", which requires examination in accordance with paragraph 341.4.1 of the B31.3 code, including random 5% Radiography (see also table 341.3.2A of B31.3 Code). Additionally, more stringent Hercules Incorporated workmanship, examination and inspection requirements that apply as stated below.

1.2.2 Owner

1.2.2.1 All references to the term "Owner" as defined in paragraph 300.b.1 and used throughout B31.3 Code shall be understood as referring to Hercules Incorporated. Hercules Incorporated is the authorized Contract Operator of the Government-Owned Radford Army Ammunition Plant.

1.2.3 Fabrication

1.2.3.1 All references to the term "Fabricator" shall be understood as also including the "Manufacturer" or "Erector" as used throughout B31.3 Code and this drawing, unless specifically excluded. It shall also be understood that the Fabricator, Erector, and Manufacturer may be a vendor(s) or firm(s) subcontracted by Hercules Incorporated to perform their respective work, U.S. Army Corps of Engineers contractor(s), or they may be Hercules Incorporated, RAAP employees.

2.0 Design

2.1 All NC piping must meet the minimum design requirements of B31.3 Code as stated above in paragraphs 1.0, 1.1, 1.2, 1.2.1, along with any requirements called forth in the approved applicable Hercules Incorporated drawings and specifications. All references to "Designer" shall be understood as referring to the Designer as defined in 300.b.(2) of B31.3. The Designer(s) may be either a subcontracted engineering firm, U. S. Army Corps of Engineers or their designated design agency, or may be Hercules Incorporated engineering personnel.

2.2 As called forth in Chapter II "Design" of the B31.3 Code, the Designer(s) must take into account the effects of pressure, temperature, and the various forces acting on the piping system along with consideration for ambient and mechanical influences, and other loadings. Additionally, the designer must take into account the various quality factors, allowable stress, and efficiency factors for the approved materials, joining and fastening methods. The Designer must prepare and submit the necessary drawings for fabrication, erection, and assembly along with bills of materials, and any required B31.3 Code calculations to Hercules Incorporated for approval, prior to any procurement of materials or starting of work.

3.0 Materials

3.1 All materials shall be provided by the Fabricator in strict accordance with the materials allowed by the B31.3 Code and the specific materials as required by the applicable Hercules Incorporated drawings and specifications.

3.2 The Fabricator shall receive, account for, and protect from loss or damage, all materials provided by Hercules Incorporated.

3.3 Substitution (including thicker wall materials) is not permitted without written authority from Hercules Incorporated.

3.4 All pressure piping parts, components, fittings, fasteners, valves, and appurtenances must be marked per their applicable specifications. Traceability by unique markings and supporting Certified Material Test Reports (MTR) or Certificates of Compliance (COC) shall be provided as required by Hercules Incorporated specifications.

4.0 Quality Assurance

4.1 Quality Control Program

4.1.1 The Fabricator must submit either a Quality Control Plan or Quality Control Manual to Hercules Incorporated for approval, that outlines how the Fabricator's own Quality Control Function (including both the program and personnel) will perform and document the required examinations and tests that assure that the requirements of this drawing are met. Additionally, the Fabricator as the Employer must submit relevant qualifications and experience information on their designated QC Examination Personnel as described in paragraph 342.1 of B31.3 Code.

5.0 Fabrication, Assembly, and Erection

5.1 All fabrication, assembly and erection as defined in B31.3 Code must be performed in strict compliance with the Hercules Incorporated approved fabrication drawings, specifications and procedures, for the particular scope of work.

5.1.1 Where particular methods, practices, or procedures are not specified by B31.3 Code or Hercules Incorporated specifications, the workmanship performed on piping is to be fabricated and erected by qualified craftsmen in a neat and workmanlike manner consistent with acceptable trade practices.

5.2 Welding

5.2.1 All welding (include tack welding) must be performed by Welding Procedure Specification (WPS's) qualified by one or more Procedure Qualification Records (PQR's) in accordance with B31.3 Chapter V and Section IX "Welding and Brazing" of the ASME Boiler and Pressure Vessel Code, latest edition.

5.2.2 All persons performing welding (including Tack Welds) must be qualified and certified by the Fabricator for the applicable WPS's used in accordance with the above same ASME Code, Section IX.

5.2.3 The Fabricator must provide copies of all applicable WPS's, PQR's and each Welder or Welding Operator Personnel Qualification Records (WPQ's) to Hercules Incorporated for acceptance, prior to any welding. Additionally, each Fabricator must submit documented evidence of current qualification, or renewal of qualification for each welder/welding operator as described in paragraph QW-322 of Section IX of the ASME Code.

5.2.4 Each Welder or Welding Operator must be assigned a unique identification symbol. Marking of this symbol to identify each weld made shall at a minimum be as outlined in paragraph 328.1(b) of B31.3 Code, and as required by Hercules Incorporated.

5.2.5 Welding Electrodes and Fillers Materials shall conform to American Welding Society (AWS) specifications, as allowed by B31.3 Code. Only those fillers and electrodes as identified on the approved WPS's may be used by the Fabricator. Substitution of filler or electrode, even within an "F" number or "A" number group as defined under paragraphs QW-430 and QW-440 of Section IX of the ASME Code is prohibited unless the WPS is properly qualified for the substitution, the WPS is properly revised by the Fabricator, and approved by Hercules Incorporated.

5.2.6 Storage of All Electrodes and Fillers must at a minimum be as recommended by their manufacturers. Electrodes must be purchased in sealed containers. All electrodes and fillers must be kept clean and dry. Exposed electrodes must be kept dry once the container seals are broken. Portable Storage ovens shall be at the job site heated to the proper temperature recommended by their manufacturer. At the end of the work day, remaining electrodes shall be removed from portable ovens and returned to their control storage ovens, which must be kept at their recommended temperatures.

5.2.7 Base Metal Preparation of the edges of the surfaces to be joined by welding shall be prepared by machining, flame cutting, plasma cutting or grinding. Surface oxides shall be removed after thermal cutting. The welding grooves shall be smooth, free of notches or harmful irregularities, clean of all oil, grease, cutting fluids or oxides, and shall meet the dimensional requirements of the approved fabrication drawings.

5.2.8 Weld Joint alignment, fit-up, preheating and interpass temperature maintenance shall be in accordance with the approved fabrication drawings and applicable WPS's. All weld preheating/interpass temperature must be in accordance with B31.3 Code paragraph 330 and Hercules Incorporated Specifications as approved on the applicable WPS's.

5.2.9 All Postweld Heat Treatment (PWHT) where required shall be by approved written procedure meeting B31.3 Code paragraphs 331. and Hercules Incorporated Specification, and must be on welds performed to WPS's qualified for PWHT.

6.0 Inspection, Examination and Testing

6.1 General

6.1.1 All references to "Inspection(s)" shall be understood by the Fabricator as referencing to inspections made by the Hercules Incorporated designated "Inspector" as defined in B31.3 Code, Chapter VI.

6.1.2 All references to "Examination(s)" shall be understood by the Fabricator as being those Quality Control Functions performed by the Fabricator's own QC Examiners, as defined in B31.3 Code Chapter VI. The Fabricator's QC Examination personnel must be free from production pressure, be given the responsibility and authority to examine as stated under Paragraph(s) 341. of B31.3 Code, and be free to take corrective action for any non-conformance arising from non-compliance to the approved drawings, specifications, procedures, and B31.3 Code. Additionally, the QC Examiners are responsible to bring all non-conformances to the attention of the Inspector for approval, prior to taking corrective action (including repairs).

6.2 The Inspector shall have access to any place where work concerning piping installation is being performed. (This includes manufacture, fabrication, heat treatment, assembly, erection, examination and testing of the piping). The Inspector shall have the right to audit the Fabricator's adherence to their Quality Control Program (see 4.0, Quality Assurance), and to inspect the piping using any examination method specified by the engineering design, review all certifications, records, and test reports to the satisfaction of Hercules Incorporated requirements.

6.3 Examination of NC piping meeting Category "D" Fluid Service for acid content less than 4%, where it's design gage pressure does not exceed 150 psi, and its design temperature is from (-20°F through 366°F), shall be performed at a minimum in accordance with paragraph 341.4.2 and 344.2 of the B31.3 Code. Examination for NC piping meeting the implicit category "Normal Service Condition" for acid content at 4% or greater, and/or where either or both the design pressures exceed 150 psi and the design temperatures are outside the (-20°F through 366°F range) at any acid content, shall comply with the requirements of paragraphs 341.4.1 and 344.2 of the B31.3 code. Additionally the following more stringent Hercules Incorporated examination requirements apply to either of the above fluid service categories

NOTE: ("*" denotes more stringent Hercules Incorporated requirements)

(*) 6.3.1 At least 5% of all fabrication for each welder's, bonder's, and operator's work performed by the Fabricator must pass a Liquid Penetrant Examination (PT) performed to approved written procedure(s) in accordance with paragraphs 341.3.4 and 344.4.1 of the B31.3 Code, and by personnel qualified and certified in accordance with paragraph 342 of B31.3 Code.

a. The 5% includes both the external and internal (where accessible) faces of each completed weld in accordance with the rules of Progressive Examination, as defined in paragraph 341.3.4 of B31.3 Code.

b. The Acceptance Criteria for the Liquid Penetrant Examination shall be as stated in Appendix 8 of Section VIII, Div-1 of the ASME B&PV Code (latest edition).

6.3.2 Visual Examination by the Fabricator shall be performed by approved written procedure as stated in paragraph 341.4.2 of B31.3 Code such that:

a. Sufficient materials and components are selected at random, to satisfy the examiner that they conform to specification, and are free from damage.

(*) b. At least 5% of fabrication, for each welder's, bonder's, and operator's, work shall be represented.

(*) c. 100% of fabrication for longitudinal welds as performed by the Fabricator, and welds other than circumferential shall be represented. Standard pressure piping components and fittings (manufactured to ASTM, ANSI, or MSS Standards) purchased under listed specification in B31.3 Code and have been manufactured using automated machine welding processes are not required to be examined by (PT) or given a minimum percentage of visual examination other than as stated in 6.3.2.(a), unless defects are suspected or evidenced during fabrication.

(*) d. Acceptance Criteria as per Table 341.3.2A of the B31.3 Code for Category "D" NC piping by Visual Examination is applicable except as follows: One or more of the following defects as detected by visual examination and/or during hydrostatic testing shall be cause for rejection.

(1) Welding performed by unqualified persons.

(2) Cracks or pinholes.

(3) Evidence of Peening.

(4) Oxidation around welds.

(5) Welds not uniform in appearance.

(6) Lack of fusion or incomplete penetration (none allowed).

(7) Weld penetration (internal protrusion or reinforcement) in excess for that allowed in Table 341.3.2A of the B31.3 Code for "Normal Service Conditions". The weld bead contour shall be smooth and have a slight convex contour.

(8) Presence of porosity, slag inclusion or overlaps.

(9) Undercutting adjacent to completed weld or evidence of undercutting by grinding.

(10) Misalignment exceeding the requirements of paragraph 5.2.8.

(11) Leaks detected during hydrostatic tests and sensitive leak tests.

e. The applicable acceptance criteria for "Normal Service" NC piping is as per Table 341.3.2A of the B31.3 Code for "Normal Service Conditions" by visual examination, and 5% Random Radiography Testing. The same examination characteristics as in 6.3.2(d) items (1 thru 11) are also rejectable for failure to meet them, but additionally for "Normal Service Conditions", failure to meet the radiographic examination requirements is also rejectable.

6.3.3 Defective Welds may be repaired subject to the authority of the Hercules Authorized Representative. Defect removal to acceptable levels, as verified by approved NDE methods, must precede any allowed repairs. All repairs must be documented, as per the approved Quality Program in Paragraph 4.0 Quality Assurance of this drawing.

6.3.4 Examination to Resolve Uncertainty Any applicable, recognized NDE method as listed in Section V of the ASME B&PV Code may be used to resolve doubtful indications. Acceptance criteria shall be those as listed for the required examination(s).

6.4 Tests

6.4.1 Hydrostatic testing shall be performed on a pressure piping system by a procedure prepared and submitted by the Fabricator and approved by the Hercules Representative. All items which could be damaged during the pressure test must be isolated. Only calibrated pressure gauges with a dial or digital readout graduated over a range of about double the intended maximum test pressure shall be used.

6.4.2 Compensation for the static head of water must be made by the Fabricator when locating the test gages. The hydrostatic pressures, temperatures, and times shall be as per the B31.3 Code and Hercules Incorporated drawing or specification.

7.0 Documentation and Records

7.1 The Fabricator is responsible to provide the Hercules Incorporated Inspector copies of all required MTR's, COC's along with in process examination records, repair records, corrective action of non-conformances, reports of liquid penetrant examination, hydrostatic test and any other tests or examinations performed by the Fabricator for acceptance of the piping system.

7.2 Finally, the Fabricator must submit a signed summary certification stating that all materials supplied, and all workmanship, examinations, and tests for the entire scope of the project have been performed in accordance with B31.3 Code and the applicable Hercules Design requirements.

MASTER CONSTRUCTION SPECIFICATION

SECTION 15500 -- PIPING FABRICATION, ERECTION, AND TESTING

1.0 GENERAL

1.1 Description. This specification, along with the work requirements outlined in paragraph 1.1.1, covers the furnishing of all material, construction equipment, accessories, tools, services, transportation, labor, and supervision required for the fabrication, erection, and testing of piping systems.

1.1.1 Work Requirements

a. Hercules data, including piping drawings and isometrics, bills of material, Line Type Specifications, and Line Designation Tables shall be used in conjunction with this specification. Should a conflict exist between this specification and any of the Hercules data or piping codes, the fabricator shall bring the conflict to the Hercules Construction Manager for resolution.

b. Changes or modifications of this specification shall be made only by mutual agreement between Hercules and the contractor.

c. Failure to comply with this specification shall be cause for rejection of all affected material or fabricated assemblies at the option of Hercules.

1.2 Quality Assurance

1.2.1 Codes and Standards

a. Unless noted otherwise, fabrication, erection, and testing shall be in accordance with ANSI/ASME B31.3, Chemical Plant and Petroleum Refinery Piping, latest edition, and other standards referred to in this specification.

NOTE: Article 9, Visual Examination -- Section V, ASME Code may be attached for field reference. Consult piping specialist.

b. This specification may be used where other sections of ANSI/ASME B31 and/or Section I of the ASME Pressure Vessel Code apply. The limits of such piping shall be indicated on the piping drawings.

c. "Latest edition" indicates the edition and addendums in effect at the time the contract or purchase order is issued.

d. Hercules Standards

1. 6DE-0A1; Criteria and Specification for Pressure Testing Piping Systems.

2. 6DE-3S1; Flanged Closures, Bolting.

3. 6DE-4E1; Pipe Thread Lubricants.

4. 6ES-5A1; Allowable Pipe Spans.

5. 6CS-6B2; Field Pressure Testing of Piping Systems.

1.3 Field Storage and Handling

1.3.1 Flange faces shall be protected from damage during storage by suitable wood, plastic, or metal covers securely bolted to the flanges. Also protect faces of flanges against corrosion, either with a durable and easily removed coating, or commercial plastic tape applied before bolting of covers to the flanges.

1.3.2 Valves and fittings in outdoor storage must be placed on planks for protection from mud, dirt, and sand. Place valves such that water will not accumulate in valve body. Fit a pipe plug in the open end of installed valves having open threaded ends to prevent corrosion of threads. Protect pipe and fittings with threaded ends from corrosion and damage to threads, both prior to and during construction.

1.3.3 All precautions shall be taken to assure internal cleanliness of fabricated piping. Flange protectors or end closures shall not be removed until time of installation. Before installing piping, it shall be examined to see that all dirt and foreign matter have been removed from inside the pipe. Wherever practical, hydrostatic test water shall be drained to promote flushing for further cleaning.

2.0 MATERIALS

2.1 Piping materials shall be in accordance with the Hercules Line Type Specifications approved for the project, and as indicated on the drawing bills of material.

2.2 The contractor shall receive, account for, and protect from loss or damage all materials provided by Hercules.

2.3 In cases where the fabricator is to furnish material, he shall furnish all pipe, flanges, fittings, and other components welded directly to the spool. The fabricator shall not furnish field assembly items (e.g., valves, gaskets, bolts).

2.4 Substitutions, including thicker wall materials, are not permitted without authorization from Hercules.

3.0 EXECUTION

3.1 General

3.1.1 Workmanship. Piping shall be fabricated and erected by qualified craftsmen in a neat and workmanlike manner consistent with acceptable trade practices.

3.1.2 Fabrication. Fabrication shall be in accordance with ANSI/ASME B31.3, Chapter V, latest edition.

a. Field fabricated, noncommercial reducers shall not be used.

b. Miter elbows are to be used only when specified on the drawings.

c. Valves shall be installed according to manufacturers' recommendations and as shown on the drawings. Do not install valves with the stem lower than horizontal or with the stem projecting into a passageway.

d. Vent and drain connections shall be provided to facilitate hydrotesting, whether shown on drawings or not, if no other method of venting at a high point or draining at a low point is available. Vents and drains shall be 1/2-inch size minimum. Drain connections shall be 3/4-inch minimum for pipes above 1 inch. Valves are not required.

e. All restrictions which would interfere with filling, draining, or flushing (such as orifice plates, rotameter floats, and flow nozzles) shall not be installed until after completion of the pressure test and line flushing operations.

f. All piping joints shall be left exposed until after completion of pressure testing.

3.1.3 Pipe Sleeves

a. Lines through building walls, floors, and roofs shall be through pipe sleeves large enough to pass a flange, and large enough for insulation and unrestricted pipe expansion and contraction, but no larger.

b. Sleeves shall be standard weight galvanized steel pipe or approved manufacturer's sleeve, furnished and installed by the mechanical contractor.

c. A weather shield shall be provided at all openings through roofs and exterior walls. Sleeves in masonry or concrete walls shall be grouted around the outside to provide an air-tight closure. After the pipe has been installed through the sleeve, the space between the sleeve and the pipe shall be filled with "Quelpyre Mastic 703-B" or approved equal, to protect the penetrations against fire.

3.1.4 Piping around equipment shall be arranged as shown on the drawings. If not shown, piping shall be arranged to permit access to equipment and to permit removal for maintenance and inspection.

3.1.5 Clearance and accessibility shall be maintained as shown on piping drawings.

3.1.6 Piping shall be installed in a manner that the resultant forces on the equipment will be kept to a minimum. Particular care shall be taken at pumps, turbines, compressors, and other mechanical equipment where piping forces can cause misalignment. Flange misalignment beyond the acceptable tolerance per ANSI B31.3, paragraph 335.1.1(c), shall be corrected by cutting and rewelding, or by such bending (hot or cold) as is practical, and not by excessive forcing of the bolting.

3.1.7 Pipe Hangers and Supports

a. The contractor shall install and align pipe supports, hangers, guides, anchors, brackets, hardware, steel work, and attachments as shown on the drawings. Pipe expansion and contraction must be compensated for as shown on the drawings.

b. When permanent pipe supports cannot be installed during erection, or are not necessary, adequate temporary supports shall be provided so that piping is not strained or deformed during the erection process. Special consideration shall be given to piping systems containing fragile materials, and to systems being hydrotested that are not designed to carry the weight of pipe full of water.

c. Where hangers, supports, and fasteners are not specified on the drawings they shall be of a type suited for the service involved and installation method recommended. They shall be designed to support piping filled with water with a safety factor of 5, based on ultimate strength. The support system shall allow for expansion and contraction of the piping, and piping shall not sag.

d. Allowable pipe spans shall be per Hercules Standard 6ES-5A1. Allowable spans for copper tubing shall be as follows:

O.D. Tubing Size	Max Span (ft)
5/8 - 3/4	6
7/8 - 1-1/8	8
1-3/8 - 2-1/8	10

e. Installation of hangers and supports shall be made of structural steel, masonry, or poured concrete. Hangers and supports shall not be installed to precast concrete, metal decks, steel bracing or bridging, conduit, or other piping.

f. Pipe shoes which are field welded to pipe shall be centered over pipe supports in the cold position.

3.1.8 Screwed Joints. Threads shall conform to the American Standard for Taper Pipe Threads, ANSI B1.20.1, and shall be concentric with the outside barrel of the pipe. Ream pipe ends to remove burrs. Threaded joint sealer shall conform to Hercules Standard 6DE-4E1 and shall be applied sparingly on pipe threads. Screw joints tightly together to make them leak-proof. Springing of a pipe to close a joint is not permitted. Protect threads against damage by a subsequent fabricating operation.

3.1.9 Flanged Joints. Bolt holes shall straddle the horizontal and vertical centerlines. Pull all bolts up evenly to ensure leak-proof and stress-free connections.

a. Slip-on flanges shall be welded inside and outside. There shall be a distance of approximately 1/16 - 1/8 inch between the edge of the fillet weld and the face of the flange.

3.1.10 Soldered Copper Joints. Surfaces to be joined by soldering shall be cleaned bright by manual or mechanical means. The joints shall be properly fluxed with noncorrosive type flux and made up with solder manufactured to approved standards.

3.1.11 Bolt thread lubricant shall be used on threads of all flanged bolting. Refer to Hercules Standard 6DE-3S1.

3.1.12 Tolerances on linear dimensions such as face-to-face, face or end-to-end, face or end-to-center, and center-to-center for shop fabricated pipe are as follows:

a. ± 1/8" for sizes 10" and under.

b. ± 3/16" for sizes 12" through 24".

c. ± 1/4" for sizes 26" through 36".

3.2 Welding

3.2.1 Qualification. Qualification of the welding procedures to be used, and of the performance of welders and welding operators, is required and shall comply with the requirements of the ASME Boiler and Pressure Vessel Code, Section IX. Contractor's welding procedures must be submitted for review and approval prior to the start of work. The contractor is responsible for the welding done by personnel of its organization, and shall conduct the required qualification tests to qualify the welding procedures and the welder or welding operators. Test joints for both procedure qualification and performance qualification shall be made as groove welds in pipe in one or more of the specified basic qualification test positions. The contractor shall maintain a record, certified by him, and available to Hercules, of the procedures used and the welders or welding operators employed by him, showing the date and result of procedure and performance qualifications, and the identification symbol assigned to each performance qualification. The qualification of procedure and the qualification of welders and welding operators must be acceptable to the Hercules authorized representative. Do not start welding until qualifications have been accepted by the Hercules representative.

a. Furnish each welder with a steel marking stencil. Each welder must identify each of his own welds with his stencil. Provide welders working close to flammable materials with fire extinguishers. Observe fire prevention precautions and avoid fire hazards and heat damage to adjacent structures. No flame-producing devices, welding, or other hot work is allowed in restricted areas without permission from plant personnel (Hot Work permit).

3.2.2 Welding Electrodes and Filler Material. Electrodes and filler material shall conform to AWS specifications for filler materials and electrodes.

3.2.3 Storage of Electrodes. Care must be exercised in handling electrodes. Electrodes shall be purchased in sealed containers. Special care shall be taken to ensure that exposed electrodes are kept dry in accordance with vendor recommendations after the container seal has been broken. Portable storage ovens shall be at the job site heated to the proper temperature recommended by the vendor. At the end of each work day, electrodes should be removed from the portable oven and returned to the central storage oven.

3.2.4 Preparation of the Base Metal

a. End Preparation. The edges of surfaces of the parts to be joined by welding shall be prepared by machining, flame cutting, and plasma cutting or grinding. If machining is impractical, grind, flame or plasma cut the pipe ends. Surface oxides shall be removed after thermal cutting. The welding grooves shall be reasonably smooth, free of notches or harmful irregularities, and must be cleaned of all oil, grease, cutting fluids, or oxides. The internal and external surfaces of parts to be joined must be free of all paint, oil, rust, scale, or other foreign matter, and should be cleaned to a bright metal surface by solvent washing and/or filing, power brushing, or power grinding.

1. End shape and dimensions shall conform to the requirements of ANSI B16.25, Butt Welding Ends, and B16.9, Wrought Steel Butt Welding Fittings, unless otherwise specified.

2. Weld groove contour shall conform to AWS recommended guidelines or as specified in the welding procedure. Root gap and land geometry shall be such that 100% full penetration is achieved.

b. Alignment. Align ends of pipe joint within the existing commercial tolerances on pipe diameters, wall thickness, and out of roundness. This alignment must be maintained during welding. Where ends of unequal internal diameters are butted and the internal misalignment exceeds 1/16 inch, taper (3:1) the item with the smaller internal diameter to equal the other. The outer diameter of sections to be welded shall be aligned within 1/16 inch. Trim length shall equal wall thickness. Trim by counterboring with bottom angle at 30° maximum from the horizontal. (Refer to ANSI B31.3, Chapter V.) Trimming shall not result in a finished wall thickness of less than the minimum required by the design conditions.

c. Clamps. Welded clips, tack welds or other appropriate means shall be used to properly align the joint for welding. After completion of the weld, all attachments shall be removed and the affected area ground and visually inspected for defects. Defects shall be repaired using a qualified welding procedure and ground smooth. Care must be taken not to reduce the pipe wall thickness when grinding down weld repairs. No backing rings shall be used.

3.2.5 Preheating requirements for all piping shall be in accordance with ANSI B31.3, paragraph 330.

3.2.6 Welding Inspection and Testing

a. All pipe welds shall have visual examination in accordance with ANSI B31.3, paragraph 344.2.

b. Lines in Category N fluid service (flammable, toxic, or with design pressure greater than 150 psig or design temperature greater than 366°F) shall have random radiograph of 5% of circumferential butt welds in accordance with ANSI B31.3, paragraph 341.4.1(b). Radiograph acceptance criteria shall be the same as for 100% radiography.

c. Category D Fluid Service (nonflammable, nontoxic, 150 psi or less design pressure and -20°F to 366°F design temperature), required examination: Visual only in accordance with ANSI B31.3, paragraph 341.4.2, and ASME, Article 9, Section V.

d. The Hercules Line Designation Table indicates the fluid service category for each line.

e. The contractor shall provide continual access for inspection of the work to the Hercules representative. No weld shall be covered, and no insulation shall be applied before the inspection has been carried out to the satisfaction of Hercules. Hercules reserves the right to reject welds upon visual inspection, hydrostatic pressure tests, or evidence of defects detected through radiography. One or more of the following defects shall be cause for rejection of a weld:

1. Failure to meet radiographic examination requirements.
2. Welding performed by unqualified persons.
3. Welds not reasonably uniform in appearance.
4. Evidence of peening.
5. Cracks or pinholes.
6. Oxidation around welds.
7. Lack of fusion and/or incomplete penetration.
8. Weld penetration in excess of 1/32 inch. Inside weld bead contour shall be smooth and have a slight convex contour.
9. The presence of porosity, slag inclusions, or overlaps.
10. Undercutting adjacent to completed weld or evidence of undercutting by grinding.
11. Misalignment exceeding the requirements of paragraph 3.2.4, of this Specification.
12. Leaks detected during hydrostatic tests and sensitive leak tests.

f. Defective welds may be repaired on the authority of the Hercules authorized representative, but any weld that shows evidence of having been repaired without authorization may be rejected. Repairs may be made to pinholes and undercutting or the final bead without authorization, but such repairs must meet the final approval of the Hercules representative. Before repairs are made, remove defects by chipping, grinding or arc-air gouging and grinding. Remove slag and scale by way of chipping and brushing. Preheat any such area before rewelding, when required by the welding procedure.

3.3 Tubing

3.3.1 Care should be taken to install tubing in a neat, orderly fashion, grouping runs where possible. Tubing shall have no flattening, crimping, or other type of deformation.

3.3.2 When running tubing from point-to-point, changes of direction or expansion loops shall be provided in order to prevent tension stresses and allow for temperature expansion.

3.3.3 Tubing should be ganged vertically, rather than horizontally, to avoid collection of dirt and corrosive conditions.

3.3.4 Care shall be taken not to install tubing at elevations subject to being used as foot, arm, or body rests.

3.3.5 Tubing shall not support the weight of valves, filters, regulators, etc. These components should have separate mounting brackets.

3.3.6 No hand bending of tubing is permitted. 1/4 inch O.D. through 1/2 inch O.D. bends shall be formed with a mechanical hand tube bender or a crank-operated manual bender. Five-eights inch O.D. and larger bends shall be formed with a crank-operated manual or hydraulic tube bender.

3.3.7 Minimum Bend Radius for Tubing

Tubing O.D (in)	Mech. Bender without Mandrel (in)
1/8	1/2
1/4	1
3/8	1-1/4 to 2
1/2	1-1/2 to 2
5/8	1-1/2 to 2-1/2
3/4	1-3/4 to 3
7/8	2 to 3-1/2

3.3.8 Tube bending shall be performed before connecting fittings.

3.3.9 Tubing fittings shall be made up with tubing wrenches designed for this purpose. Wrenches of this type equalize the torque over five corners and prevent slipping and distortion of the hexagon nut.

3.3.10 Fittings should be staggered and offset when making multiple runs to provide easier installation and fitting accessibility.

3.4 Cold Bending and Flanging

3.4.1 Only the following pipe shall be used for cold bending and flanging:

a. Carbon Steel: ASTM A587.

b. Stainless Steel. ASTM A312, (Types 304, 304L, 316, 316L), full finished quality, suitable for cold bending and flanging.

3.4.2 Only qualified personnel, trained to Hercules procedures, shall be permitted to operate bending and flanging machine.

3.4.3 Pipe ends for bending and flanging shall be square and true, with cuts made by mechanical device. Cuts made by acetylene torch or plasma arc machine are not permitted.

3.4.4 End ridges must be removed by drum grinder or coarse file prior to bending or flanging.

3.4.5 Bend heel wall thickness, flange lap thickness and diameter shall be checked at random to assure conformance to ANSI B31.3 Section 306.2 and 306.4.2. In no case shall bend wall thickness be reduced by more than 20% of nominal wall thickness.

3.4.6 Prior to installation of piping, all internal lubrication material must be removed from bends. This should be done as soon as possible to avoid the hardening and drying out of lubricant.

3.5 Polyvinyl Chloride Pipe Joints. Solvent cement-type joint shall be used. Pipe ends shall be cut square and then chamfered 10° to 15°. Lightly sand area and wipe clean. Check "dry fit" of pipe, and then apply primer to socket and pipe surface. Apply solvent cement while both surfaces are still wet with primer. While both surfaces are wet with solvent cement, insert pipe end into socket with 1/4 turn twisting motion insuring that pipe end goes to the bottom of socket, completing within one minute. Hold joint together for 30 seconds until both ends are firmly gripped. Allow set time according to the following table before distrubing joints.

Time (min)	Temperature (°F)
30	60 to 100
60	40 to 60
120	20 to 40
240	0 to 20

Primer and solvent cement shall be supplies by piping manufacturer and applied according to manufacturer recommendations.

3.6 Fiberglass Reinforced Plastic Pipe Joints

3.6.1 Socket Type Joints. These joints join with adhesive per manufacturer's recommendations. Pipe ends shall be cut square, and joint area shall be lightly sanded and wiped clean. Apply adhesive to socket and pipe surface and insert pipe end into the socket slowly and without twisting. Fabricated assemblies should be handled carefully to prevent movement of the joint before complete curing.

Curing at temperatures below 60°F is not recommended. External heat may be applied to aid curing. Do not exceed 200°F.

3.6.2 Flanged Joints. These joints provide washers under all bolt heads and nuts. Provide a spacer outside the raised face when mating a fiberglass flange to a raised face flange.

3.6.3 Bonding. Qualification of the bonding procedures to be used, and of the performance of bonders and bonding operators, is required and shall comply with the requirements in ASME/ANSI B31.3, paragraph A328.

3.7 Hydrostatic Testing. Hydrostatic testing shall be performed in accordance with Hercules Standards 6CS-6B2 and 6DE-0A1. All items that could be damaged during pressure testing (e.g., vessels, heat exchangers, pumps, compressors, relief valves, rupture disks, diaphragm instruments, orifice plates, filters, strainers, expansion joints), shall be isolated from test pressures or removed.

SECTION 11211A

PUMPS: INDUSTRIAL, CENTRIFUGAL
12/88

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(1997ael) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(1997) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM D 975	(1998b) Diesel Fuel Oils

ASME INTERNATIONAL (ASME)

ASME B1.1	(1989) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.5	(1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices

HYDRAULIC INSTITUTE (HI)

HI 1.1-1.5	(1994) Standards for Centrifugal Pumps

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(1998) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 20	(1996; Errata Oct 1996; TIA 96-1) Installation of Centrifugal Fire Pumps
NFPA 30	(1996; Errata; TIA 96-2) Flammable and Combustible Liquids Code
NFPA 37	(1998) Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	(1999) National Electrical Code

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 21	(1991) White or Colored Silicone Alkyd Paint
SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)

UNDERWRITERS LABORATORIES (UL)

UL 448	(1994; Rev thru May 1999) Pumps for Fire-Protection Service

1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate equipment that has been in satisfactory waterworks operation at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the jobsite. Pumps motors of the same types shall each be the product of one manufacturer.

1.2.2 Description

The pumps shall be horizontal centrifugal water pumps of the types indicated and specified. The single driving units for the pumps shall be electric motors as indicated and specified.

1.2.3 Governing Requirements

Fire pumps and appurtenances shall conform in all respects to NFPA 20.

1.2.4 Safety Requirements

Gears, couplings, projecting set-screws, keys, and other rotating parts, so

located that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.

1.2.5 Nameplates

Pumps and motors shall have a standard nameplate securely affixed in a conspicuous place showing the manufacturer's name, address, type or style, model, serial number, and catalog number. In addition, the nameplate for each pump shall show the capacity in gpm at rated speed in rpm and head in feet of water. Nameplate for each electric motor shall show at least the minimum information required by 10.38 NEMA MG 1. Such other information as the manufacturer may consider necessary to complete identification shall be shown on the nameplate.

1.2.6 Electrical Work

Electrical motor driven equipment specified herein shall be provided complete with motors, motor starters, and controls. Electric equipment and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as indicated. Equipment for control of automatic fire pumps shall be in accordance with NFPA 20. Motor starters shall be provided complete with properly sized thermal overload protection in each phase and other appurtenances necessary for the motor control specified. Each motor shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor when operating at proper electrical system voltage and frequency. Manual or automatic control and protective or signal devices required for the operation herein specified and any control wiring required for controls and devices but not shown on electrical plans shall be provided under this section of the specifications.

1.2.7 Selection Criteria

Pumps shall be designed using hydraulic criteria based upon actual model developmental test data. Pumps shall be selected at a point within the maximum efficiency for a given impeller casing combination. Deviations within 3 percent of maximum efficiency are permissible, provided the lesser efficiency is not less than the scheduled efficiency. Pumps having impeller diameters larger than 90 percent of the published maximum diameter of the casing or less than 15 percent larger than the published minimum diameter of the casing will be rejected. Acceptable maximum impeller diameter calculations shall not be based on percentage of impeller diameter range for a given casing.

1.2.8 Conformance With Agency Requirements

Where materials or equipment are specified to be an approved type, the seal or label of approval from a nationally recognized testing agency, adequately equipped and competent to perform such services, shall be attached thereto. A written certificate from the testing agency shall accompany the materials or equipment and shall be submitted to the Contracting Officer stating that the items have been tested and that they conform to the applicable requirements of the specifications and to the standards listed herein. The certificate shall indicate the methods of

testing used by the testing agency. In lieu of a certificate from a testing agency, published catalog specification data, accompanied by the manufacturer's certified statement to the effect that the items are in accordance with the applicable requirements of the specifications and the referenced standards, will be considered by the Contracting Officer and may be acceptable as evidence that the items conform with agency requirements.

1.2.9 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing the work.

1.2.10 Factory Tests

Pumps shall be tested by the manufacturer or a nationally recognized testing agency in compliance with Hydraulic Institute Standards. Where two or more identical pumps are specified, only one representative pump shall be tested. Certified test results shall be submitted to the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation; G, SWAO

Drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation. A complete listing of equipment and materials shall be provided.

SD-03 Product Data

Materials and Equipment; G, SWAO

Manufacturer's descriptive data and technical literature, performance charts and curves for all impeller sizes for a given casing, catalog cuts, and installation instructions. Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 3 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies, with current unit prices and source of supply.

Instructions; G, SWAO

Proposed diagrams, instructions, and other sheets, prior to posting. Approved wiring and control diagrams showing the complete layout of the entire system, including equipment, piping valves, and control sequence, framed under glass or in approved laminated plastic, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams, and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

Training Period; G, SWAO

Training course curriculum and training instructions shall be furnished to the Contracting Officer 14 days prior to the start of training.

SD-06 Test Reports

Tests; G, SWAO

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-07 Certificates

Manufacturer's Representative; G, SWAO

The names and qualifications of the manufacturer's representative and training engineers and written certification from the manufacturer that the representative and trainers are technically qualified.

SD-10 Operation and Maintenance Data

Centrifugal Pump System; G, SWAO

Six complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment. One complete set at the time the tests procedure is submitted; remaining sets before the contract is completed. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS," name and location of the building, name of the Contractor, and contract number. Flysheets shall be placed before instructions covering each subject. Instruction sheets shall be approximately 8-1/2 by 11

inches, with large sheets of drawings folded in. Instructions shall include, but not be limited to, the following:

a. System layout showing piping, valves, and controls.

b. Approved wiring and control diagrams.

c. A control sequence describing startup, operation, and shutdown.

d. Operating and maintenance instructions for each piece of equipment, including lubrication instructions and troubleshooting guide.

e. Manufacturer's bulletins, cuts, and descriptive data; and parts list and recommended spare parts.

1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified below and as shown, and shall be suitable for the service intended. Materials and equipment shall be new and unused, except for tests. Where two or more pieces of equipment performing the same function are required, they shall be duplicate products of the same manufacturer.

2.2 CENTRIFUGAL WATER PUMPS

The pumps shall be as specified on the drawings. Pumps are to be designed for industrial service with all wetted parts manufactured with Carpenter 20 or approved equal.

2.2.1 Pump Service

The pumps shall be utilized for the Acid Waste/Acid Sewer and Nitrocellulose production systems.

2.2.2 Pump Drives

The pumps shall have the following driving units and shall be directly connected to the driving units through solid shafts, flexible couplings, or free wheeling clutches (as appropriate).

2.2.3 Pump Construction

Except as below specified, centrifugal pumps including required priming equipment shall be constructed in accordance with the Hydraulic Institute

HI 1.1-1.5.

2.2.4 Pump Characteristics

The pumps shall be capable of discharging quantities at total discharge heads measured at the discharge flange as specified on the drawings.

Pumps shall operate at optimum efficiencies to produce the most economical pumping system under the conditions encountered and shall be sized to make optimum match with the system head curve as shown for Goulds Model 3796 (or approved equal) for Pumps 3058-P1 & P2 and 3056-P1, P2 & P5; Goulds Model 3900 (or approved equal) for Pump 3058 - P3; Goulds Model 5150 Variable Speed (or approved equal) for Pump 3056-P3 & P4. Pumps shall furnish not less than 150 percent of rated capacity at a total discharge head of not less than 65 percent of total rated head.

2.2.5 Pump Casings

Pump casings shall be high chrome abrasive resistant alloy construction such as Carpenter 20 (or approved equal).

The casings shall be designed to permit replacement of wearing parts. Pump casings shall be of uniform quality and free from blowholes, porosity, hard spots, shrinkage defects, cracks and other injurious defects. Defects in casings shall not be repaired except when such work is approved and is done by or under the supervision of the pump manufacturer, and then only when the defects are small and do not adversely affect the strength or use of the casing. Casings shall be single volute with flanged piping connections conforming to ASME B16.1, Class 125. The direction of shaft rotation shall be conspicuously indicated. The casing shall have tapped openings for air venting, priming, draining, and suction and discharge gauges.

2.2.6 Impellers

Impellers shall be of semi-open, or enclosed design and shall be constructed of high chrome abrasion resistant alloy, carefully finished with smooth water passageways, and shall be dynamically balanced. Impellers shall be securely keyed to the pump shaft and connected through a thrust collar. Provisions shall be made for vertical impeller adjustment at the top of the motor.

2.2.7 Wearing Rings

Wearing rings shall not be provided for impellers.

2.2.8 Shaft

Shaft shall be of 400 series SS compatible with the working fluid, accurately machined, and shall be of sufficient size and strength to perform the work required. Vertical shafts shall be adequately provided with alignment bearings.

2.2.9 Gland

Gland shall be stainless steel with AISI 18-8 stainless steel eyebolts and pins or studs. Hex-nuts shall be nongalling stainless steel.

2.2.10 Mechanical Seals (if required)

Mechanical seals shall be balanced or unbalanced, as necessary to conform to specified service requirements. Mechanical seals shall be constructed in a manner and of materials particularly suitable for the temperature service range and quality of water being pumped. Seal construction shall not require external source cooling for pumped-fluid service temperatures up to 250 degrees F. Seal pressure rating shall be suitable for maximum system hydraulic conditions. Materials of construction shall include AISI 300 series stainless steel, solid tungsten-carbide rotating-seal face, and Buna-N vinylidene-fluoride-hexafluoropropylene, EPT, or tetrafluoroethylene seals. Bypass flushing water supply shall be free of iron rust products and other abrasive materials and shall be directed onto face of seal without dead ending. All piping and accessories shall be provided. Throttling bushing shall have clearances to minimize leakage in case of complete seal failure without restriction of flushing water. Mechanical seals shall not be subjected to hydrostatic test pressures in excess of the manufacturer's recommendations.

2.2.11 Couplings

Couplings shall be of the heavy-duty flexible type, keyed and locked to the shaft. Couplings for vertical pumps other than close-coupled vertical pumps may be of the universal type. Flexible couplings shall not be used to compensate for misalignment of pump.

2.2.12 Balance

All rotating parts of the equipment shall operate throughout the required range without excessive end thrust, vibration, or noise. Defects of this type that cannot be eliminated by installation adjustments will be sufficient cause for rejection of the equipment. Pump impeller assemblies shall be statically and dynamically balanced to within 4 W/N, where W equals weight and N equals speed. Shaft construction shall be substantial to prevent seal or bearing failure due to vibration. Total shaft peak-to-peak dynamic deflection measured by vibrometer at pump-seal face shall not exceed 2.0 mils under shutoff-head operating conditions. Flow from 1/4 inch iron pipe size (ips) pipe shall be provided during testing.

2.2.13 Bearings

Bearings shall be ball type, and the main bearings shall take all radial and down thrust. Pumps that depend only on hydraulic balance to overcome end thrust will not be acceptable.

2.2.14 Lubrication

Bearings on vertical shaft pumps shall be oil or grease type. Pumps with oil-lubrication systems shall be designed so that all shaft bearings will be isolated from the pumped liquid. An automatic sight feed oiler shall be

provided on a suitable mounting bracket with connection to the shaft tube. Grease type bearings shall be provided with fittings for a grease gun and, if the bearings are not easily accessible, with grease tubing extending to convenient locations. The grease fittings shall be of a type that prevent over lubrication and the buildup of pressure injurious to the bearings

2.2.15 Base Plates

The pumps shall be mounted on rigid simplex base/mounting plates. Vertical-shaft pumps shall be provided with complete mounting suitable for the type of pump furnished, with the base for the pump separate from the base of the driving unit. The drainage structure shall collect the packing box leakage and shall have a 15 nun (1/2-inch) 1/2-inch NPT connection to connect it to a drain.

2.2.16 Cocks, Plugs, and Accessories

The pumps shall be equipped with single gauges indicating pressures for all lines where indicated. Gauges, equipped with a shutoff cock and snubber, shall conform to ASME B40.l, and shall be calibrated in kilopascals and pounds per square inch pounds per square inch in not more than 10 kPa and 2 psi 2 psi increments. Gauge ranges shall be appropriate for the particular installation. Pressure relief valve shall be furnished and installed where indicated.

2.2.17 Piping Connections

The pump suction and discharge shall be provided with flanged connections of suitable size and suitably arranged for piping shown. Pipe flanges shall conform to ASME B16.1 and ASME B16.5. Piping shall be installed to preclude the formation of air pockets.

2.2.18 Finish

Pump shall have painted or enameled finish as is standard with the manufacturer.

2.3 ELECTRICAL EQUIPMENT

Electrical equipment shall conform to Section 16415 ELECTRICAL WORK, INTERIOR. Electrical motor driven equipment herein specified shall be provided complete with motors, motor starters, and controls. Motor controls, equipment, and wiring shall be in accordance with NFPA 70.

2.3.1 Electric Motors

Each electric motor-driven pump shall be driven by an electric motor. In non-hazardous areas the motors shall be totally-enclosed, fan-cooled. continuous-duty electric motors. Motors shall be squirrel-cage induction motors having nonnal starting torque and low starting current characteristics, and shall be of sufficient size so that the nameplate horsepower rating will not be exceeded throughout the entire published pump characteristic curve.

In hazardous areas the motors shall be rated for a Class 1 and 2, Division I. Groups C, D. E, F, and G areas, continuous duty electric motor. Motors shall be squirrel-cage induction motors having normal starting torque and low starting current characteristics, and shall be of sufficient size so that the nameplate horsepower rating will not be exceeded throughout the entire published pump characteristic curve.

Motor bearings shall provide smooth operations under the conditions encountered for the life of the motor. Adequate thrust bearing shall be provided in the motor to carry the weight of all -rotating parts plus the hydraulic thrust and shall be capable of withstanding upthrust imposed during pump starting. All motors shall conform to NEMA MG 1. Motors shall have a minimum service factor of 1.15.

All motors over 1 hp shall be rated for 460V, 3 phase operation. All motors shall be high efficiency design E type. Motors 200 hp and over shall be provided with space heaters operating at 120V, 200W maximum

2.3.2 Control Equipment

Manually controlled pumps shall have START-STOP pushbutton in cover. Automatically controlled pumps shall have three-position "MANUAL-OFF-AUTOMATIC" selector switch in cover. Additional controls or protective devices shall be as indicated. A pump low-water cutoff shall be installed in the well or on the suction pipe and shall shut the pump off when the fluid level in the well reaches the level shown.

2.3.3 Variable Speed Controls

The variable speed motor controller shall convert 460 volt plus 15 percent, minus 5 percent, three phase, 60 Hz (plus or minus 2 Hz) utility power to adjustable voltage/frequency, three phase, ac power for stepless motor control from 5 percent to 105 percent of base speed.

2.3.3.1 Description

The variable speed drive shall produce an adjustable ac voltage/frequency output for complete motor speed control. The variable speed drive shall be automatically controlled by a grounded electronic control signal. The variable speed drive shall be self contained, totally enclosed in a NEMA MG 1 ventilated cabinet and capable of operation between 32 and 104 degrees F. The variable speed drive maximum output current rating shall be equal to or exceed the motor nameplate full load. The manufacturer shall advise the maximum recommended motor sine wave current for each controller rating. Variable speed drive multiple motor operation at same frequency/speed shall be possible as long as the sum of connected motor full load sine wave currents are less than or equal to the variable speed drive maximum continuous current rating. Variable speed drive shall be 95 percent efficient at 100 percent rated output power, 60 Hz.

2.3.3.2 Governing Requirements

Variable speed drives shall conform to the following requirements:

a. Variable speed drive shall comply with 47 CFR 15 regulation of RF1/EM1 emission limits for Class A computing devices. The FCC label of compliance shall be displayed on the variable speed drive.

b. The variable speed drive and options shall comply with the applicable requirements and the standards of the American National Standards Institute (ANSI).

c. Variable speed drive and option design and construction thereof shall comply with all applicable provisions of NFPA 70, Article 43D, Sections A-L.

2.3.3.3 Quality Assurance

To ensure quality the variable speed drive shall be subject to the following tests:

a. The integrated circuits shall undergo a 160-hour "burn-in" to test reliability. During the "burn-in" the temperature shall be cycled between 32 and 158 degrees F.

b. The completed unit shall undergo a fully loaded 24-hour "burn-in."

c. The unit shall be subject to a series of in-plant quality controlled inspections before approval for shipment from manufacturer's facilities.

2.3.3.4 Service

The variable speed drive shall be supplied with the following:

a. One-year parts and labor warranty.

b. A troubleshooting guide to help the building operator determine what steps must be taken to correct any problem that may exist in the system.

2.3.3.5 Basic Features

The variable speed drive shall have the following basic features:

a. Hand/Off/Auto Operation.

b. Manual/Auto speed reference switch.

c. Minimum/maximum adjustable speeds.

d. Speed potentiometer.

e. Auto restart.

f. Linear timed acceleration and deceleration for soft

starting/stopping.

g. 3-63 Hz controlled speed range. (Factory set at 15 Hz minimum).

h. Terminal connections for time clock control, fire, smoke, freeze detectors, and EP relay pre-set speed override.

i. Output frequency terminals for remote metering.

2.3.3.6 Protective Circuits and Features

The variable speed drive controller shall include the following protective circuits/features:

a. Current limits to 100 percent design by slowing down motor.

b. Instantaneous Electronic Trip - automatically shutdown motor if current exceed 120 percent of design or phase-to-phase output short circuit occurs.

c. The variable speed drive will restart automatically when input line returns to normal in the event of intermittent power outage or phase loss or overvoltage shutdown.

d. Input power protection shuts down the unit if the following faults occur; low input line voltage or loss of an input phase.

e. Insensitive to incoming power phase.

f. Fast acting current limiting input fuses, (Class J) rated with 200,000 interrupting amperes capability.

g. Isolated 115 volt control circuit and dedicated control transformer.

h. Line-to-line fault protection.

i. Line-to-ground short circuiting and accidental motor grounding protection.

j. Output thermal overload relay trip.

2.3.3.7 Adjustments

The variable speed drive has the following adjustments available via potentiometers located on the faceplate of a single, regulator printed circuit board.

a. Minimum speed: 0-75 percent

b. Maximum speed: 100 percent

2.4 EQUIPMENT APPURTENANCES

2.4.1 Attachments

All necessary bolts, nuts. washers, bolt sleeves, and other types of attachments for the installation of the equipment shall be furnished with the equipment. Bolts shall conform to the requirements of ASTM A 307 and nuts shall be hexagonal of the same quality as the bolts used. Threads shall be clean-cut and shall conform to ASME B 1.1. Bolts, nuts. and washers shall be stainless steel type 316.

2.4.2 Equipment Guards

Equipment driven by open shafts, belts, chains, or gears shall be provided with all-metal guards enclosing the drive mechanism. Guard shall be constructed of galvanized sheet steel or galvanized woven wire or expanded metal set in a frame of galvanized steel members. Guards shall be secured in position by steel braces or straps which will permit easy removal for servicing the equipment. The guards shall conform in all respects to all applicable safety codes and regulations.

2.4.3 Tools

A complete set of all special tools which may be necessary for the adjustment, operation, maintenance, and disassembly of all equipment shall be furnished. Special tools are considered to be those tools which because of their limited use are not normally available, but which are necessary for the particular equipment. Special tools shall be high-grade, smooth, forged, alloy, tool steel. One pressure grease gun for each type of grease required for motors shall also be furnished. All tools shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such tools until completion of the work, at which time they shall be delivered to the Contracting Officer.

2.4.4 Shop Painting

All motors, pump casings, and similar parts of equipment customarily finished in the shop shall be thoroughly cleaned, primed, and given two finish coats of paint at the factory in accordance with the recommendations of the manufacturer. Ferrous surfaces not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.

PART 3 EXECUTION

3.1 INSTALLATION

Each pump and engine shall be installed in accordance with the written instructions of the manufacturer and under the supervision of the manufacturer's representative.

3.1.1 Concrete Foundations

Concrete for equipment foundations and for any required ballast for fuel storage tanks shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete foundations shall be integral with and of the same class as that of the building floor unless otherwise indicated. Concrete

having a compressive strength of at least 2,500 psishall be used in foundations that are entirely separated from the surrounding floor. A premolded filler strip shall be installed between the foundation and floor slab as shown. Foundation bolts, as required, shall be furnished for proper positioning during the placement of the concrete.

3.2 TESTS

After installation of the pumping units and appurtenances is complete, operating tests shall be carried out to assure that the pumping installation operates properly. The Contractor shall make arrangements to have the manufacturer's representatives present when field equipment tests are made. Each pumping unit shall be given a running field test in the presence of the Contracting Officer for a minimum of 2 hours. Each pumping unit shall be operated at its rated capacity or such other point on its head-capacity curve selected by the Contracting Officer. The Contractor shall provide an accurate and acceptable method of measuring the discharge flow. Tests shall assure that the units and appurtenances have been installed correctly, that there is no objectionable heating, vibration, or noise from any parts, and that all manual and automatic controls function properly. If any deficiencies are revealed during any tests, such deficiencies shall be corrected and the tests shall be reconducted.

3.3 FIELD PAINTING

Stainless steel, galvanized steel, and nonferrous surfaces shall not be painted.

3.3.1 Touch-Up Painting

Factory painted items requiring touching up in the field shall be thoroughly cleaned of all foreign material and shall be primed and topcoated with the manufacturer's standard factory finish.

3.3.2 Exposed Ferrous Surfaces

Exposed ferrous surfaces shall be painted with two coats of enamel paint conforming to FS TT - E-489, Class A. Factory primed surfaces shall be solvent-cleaned before painting. Surfaces that have not been factory primed shall be prepared and primed with one coat of FS TT - E-489, Class A or in accordance with the enamel paint manufacturer's recommendations.

3.4 MANUFACTURER'S REPRESENTATIVE

The Contractor shall obtain the services of a manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installation, adjustment, and testing of the equipment. Up to 5 days service shall be provided at no expense to the Government.

3.5 DEMONSTRATION

Upon completion of the work and at a time designated by the Contracting Officer, the services of one or more competent engineers shall be provided

by the Contractor for a training period of not less than 8 hours to instruct a representative of the Government in the operation and maintenance of equipment furnished under this section of the specifications. These field instructions shall cover all the items contained in the bound instructions.

-- End of Section --

SECTION 16262

AUTOMATIC TRANSFER SWITCH AND BY-PASS/ISOLATION SWITCH
07/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 117	(1997) Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.13	(1990; R 1995) Low-Voltage AC Power Circuit Breakers Used in Enclosures
IEEE C37.90.1	(1989; R 1994) IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
IEEE C62.41	(1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits
IEEE Std 602	(1996) Electric Systems in Health Care Facilities

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(1993) Industrial Controls and Systems
NEMA ICS 2	(1993) Industrial Controls and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC
NEMA ICS 4	(1997) Industrial Control and Systems Terminal Blocks
NEMA ICS 6	(1993) Industrial Control and Systems, Enclosures
NEMA ICS 10	(1999) Industrial Control and Systems: AC Transfer Switch Equipment - Part 2: Static AC Transfer Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1999) National Electrical Code
NFPA 110	(1999) Emergency and Standby Power Systems

UNDERWRITERS LABORATORIES (UL)

UL 1008	(1996; Rev thru Feb 1999) Transfer Switch Equipment
UL 1066	(1997) Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Switches; G, SWAO

Schematic, external connection, one-line schematic and wiring diagram of each ATS assembly. Interface equipment connection diagram showing conduit and wiring between ATS and related equipment. Device, nameplate, and item numbers shown in list of equipment and material shall appear on drawings wherever that item appears. Diagrams shall show interlocking provisions and cautionary notes, if any. Operating instructions shall be shown either on one-line diagram or separately. Unless otherwise approved, one-line and elementary or schematic diagrams shall appear on same drawing.

Equipment; G, SWAO
Installation; G, SWAO

Dimensioned plans, sections and elevations showing minimum clearances, weights, and conduit entry provisions for each ATS.

SD-03 Product Data

Material; G, SWAO
Equipment; G, SWAO

List of proposed equipment and material, containing a description of each separate item.

SD-06 Test Reports

Testing; G,

A description of proposed field test procedures, including proposed date and steps describing each test, its duration and expected results, not less than 2 weeks prior to test date.

Certified factory and field test reports, within 14 days following completion of tests. Reports shall be certified and dated and shall demonstrate that tests were successfully completed prior to shipment of equipment.

SD-07 Certificates

Equipment; G
Material; G

Certificates of compliance showing evidence of UL listing and conformance with applicable NEMA standards. Such certificates are not required if manufacturer's published data, submitted and approved, reflect UL listing or conformance with applicable NEMA standards.

Switching Equipment; G,

Evidence that ATS withstand current rating (WCR) has been coordinated with upstream protective devices as required by UL 1008. Upon request, manufacturer shall also provide notarized letter certifying compliance with requirements of this specification, including withstand current rating.

SD-10 Operation and Maintenance Data

Switching Equipment; G,
Instructions; G,
Six copies of operating manual outlining step-by-step procedures for system startup, operation, and shutdown. Manual shall include manufacturer's name, model number, service manual, parts list, and brief description of equipment and basic operating features. Manufacturer's spare parts data shall be included with supply source and current cost of recommended spare parts. Six copies of maintenance manual listing routine maintenance, possible breakdowns, repairs, and troubleshooting guide. Manual shall include simplified wiring and control diagrams for system as installed.

1.3 GENERAL REQUIREMENTS

1.3.1 Standard Product

Material and equipment shall be standard products of a manufacturer regularly engaged in manufacturing the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. The experience use shall include applications in similar circumstances and of same design and rating as specified ATS. Equipment shall be capable of being serviced by a manufacturer-authorized and trained organization that is, in the Contracting Officer's opinion,

reasonably convenient to the site.

1.3.2 Nameplate

Nameplate showing manufacturer's name and equipment ratings shall be made of corrosion-resistant material with not less than 1/8 inch tall characters. Nameplate shall be mounted to front of enclosure and shall comply with nameplate requirements of NEMA ICS 2.

1.4 SERVICE CONDITIONS

ATS shall be suitable for prolonged performance under following service conditions:

a. Altitude: 1800 feet above mean sea level.

b. Relative Humidity: 100 percent maximum, continuous.

c. Temperature: Minus -10 to 110 degrees F.

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH (ATS)

ATS shall be electrically operated and mechanically held in both operating positions. ATS shall be suitable for use in standby systems described in NFPA 70. ATS shall be UL listed. ATS shall be manufactured and tested in accordance with applicable requirements of IEEE C37.90.1, IEEE C37.13, IEEE C62.41, IEEE Std 602, NEMA ICS 1, NEMA ICS 2, NEMA ICS 10, UL 1008 and UL 1066. ATS shall conform to NFPA 110. To facilitate maintenance, manufacturer's instruction manual shall provide typical maximum contact voltage drop readings under specified conditions for use during periodic maintenance. Manufacturer shall provide instructions for determination of contact integrity. ATS shall be rated for continuous duty at specified continuous current rating. ATS shall be fully compatible and approved for use with BP/IS specified. BP/IS shall be considered part of ATS system. ATS shall have following characteristics:

a. Voltage: 480 volts ac.

b. Number of Phases: Three.

c. Number of Wires: Four.

d. Frequency: 60 Hz.

e. Poles: As shown on drwgs.

f. ATS WCR: Rated to withstand short-circuit current of 30 amperes, RMS symmetrical.

g. Nonwelding Contacts: Rated for nonwelding of contacts when used with upstream feeder overcurrent devices shown and with available fault current specified.

h. Main and Neutral Contacts: Contacts shall have silver alloy composition. Neutral contacts shall have same continuous current rating as main or phase contacts.

2.1.1 Override Time Delay

Time delay to override monitored source deviation shall be adjustable from 0.5 to 6 seconds and factory set at 1 second. ATS shall monitor phase conductors to detect and respond to sustained voltage drop of 25 percent of nominal between any two normal source conductors and initiate transfer action to alternate source and start engine driven generator after set time period. Pickup voltage shall be adjustable from 85 to 100 percent of nominal and factory set at 90 percent. Dropout voltage shall be adjustable from 75 to 98 percent of pickup value and factory set at 85 percent of nominal.

2.1.2 Transfer Time Delay

Time delay before transfer to alternate power source shall be adjustable from 0 to 5 minutes and factory set at 3 minutes. ATS shall monitor frequency and voltage of alternate power source and transfer when frequency and voltage are stabilized. Pickup voltage shall be adjustable from 85 to 100 percent of nominal and factory set at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal and factory set at 90 percent.

2.1.3 Return Time Delay

Time delay before return transfer to normal power source shall be adjustable from 0 to 30 minutes and factory set at 30 minutes. Time delay shall be automatically defeated upon loss or sustained undervoltage of alternate power source, provided that normal supply has been restored.

2.1.4 Engine Shutdown Time Delay

Time delay shall be adjustable from 0 to 30 minutes and shall be factory set at 10 minutes.

2.1.5 Exerciser

Provide a generator exerciser timer. Run times shall be user programmable. The generator exerciser shall be selectable between load transfer and enginer run only, and shall have a fail-safe feature that will retransfer the ATS to normal during the exercise period.

2.1.6 Auxiliary Contacts

Two normally open and two normally closed auxiliary contacts rated at 15 amperes at 480 volts shall operate when ATS is connected to normal power source, and two normally open and two normally closed contacts shall operate when ATS is connected to alternate source.

2.1.7 Supplemental Features

ATS shall be furnished with the following:

a. Engine start contact.

b. Alternate source monitor.

c. Test switch to simulate normal power outage.

d. Voltage sensing. Pickup voltage adjustable from 85 to 100 percent of nominal; dropout adjustable from 75 to 98 percent of pickup.

e. Time delay bypass switch to override return time delay to normal.

f. Manual return-to-normal switch.

g. Means shall be provided in the ATS to insure that motor/transformer load inrush currents do not exceed normal starting currents. This shall be accomplished with either in-phase monitoring, time-delay transition, or load voltage decay sensing methods. If manufacturer supplies an in-phase monitoring system, the manufacturer shall indicate under what conditions a transfer cannot be accomplished. If the manufacturer supplies a time-delay transition system, the manufacturer shall supply recommendations for establishing time delay. If load voltage decay sensing is supplied, the load voltage setting shall be user programmable.

2.1.8 Operator

Manual operator conforming to UL 1008 shall be provided, and shall incorporate features to prevent operation by unauthorized personnel. ATS shall be designed for safe manual operation under full load conditions. If manual operation is accomplished by opening the door, then a dead-front shall be supplied for operator safety.

2.1.9 Override Switch

Override switch shall bypass automatic transfer controls so ATS will transfer and remain connected to alternate power source, regardless of condition of normal source. If alternate source fails and normal source is available, ATS shall automatically retransfer to normal source.

2.1.10 Green Indicating Light

A green indicating light shall supervise/provide normal power source switch position indication and shall have a nameplate engraved NORMAL.

2.1.11 Red Indicating Light

A red indicating light shall supervise/provide alternate power source switch position indication and shall have a nameplate engraved ALTERNATE.

2.2 BY-PASS/ISOLATION SWITCH (BP/IS)

2.2.1 Design

Bypass/isolation switch (BP/IS) shall permit load by-pass to either normal or alternate power source and complete isolation of associated ATS, independent of ATS operating position. BP/IS and associated ATS shall be products of same manufacturer and shall be completely interconnected and tested at factory and at project site as specified. BP/IS shall be manufactured, listed, and tested in accordance with paragraph AUTOMATIC TRANSFER SWITCH (ATS) and shall have electrical ratings that exceed or equal comparable ratings specified for ATS. Operating handles shall be externally operated and arranged so that one person can perform the bypass and isolation functions through the operation of a maximum of two handles within 5 seconds. The ATS shall have provisions for locking in the isolation position. Handle for manual operation shall be permanently attached to operating mechanism. BP/IS operation shall be accomplished without disconnecting switch load terminal conductors. Isolation handle positions shall be marked with engraved plates or other approved means to indicate position or operating condition of associated ATS, as follows:

a. Indication shall be provided to show that ATS section is providing power to the load.

b. Indication shall be provided of ATS isolation. The ATS controls shall remain functional with the ATS isolated or in bypass mode to permit monitoring of the normal power source and automatic starting of the generator in the event of a loss of the normal power source. In the isolated mode, the bypass section shall be capable of functioning as a manual transfer switch to transfer the load to either power source. The ATS shall be capable of undergoing functional operation testing without service interruption. The ATS may also be completely removed from the enclosure, if required for maintenance or repair, while the bypass section continues to power the load.

2.2.2 Switch Construction

Bypass/isolation switch shall be constructed for convenient removal of parts from front of switch enclosure without removal of other parts or disconnection of external power conductors. Contacts shall be as specified for associated ATS, including provisions for inspection of contacts without disassembly of BP/IS or removal of entire contact enclosure. To facilitate maintenance, manufacturer shall provide instructions for determination of contact integrity. BP/IS and associated ATS shall be interconnected with suitably sized copper bus bars silver-plated at each connection point, and braced to withstand magnetic and thermal forces created at WCR specified for associated ATS.

2.3 ENCLOSURE

ATS and accessories shall be installed in floor-mounted, unventilated NEMA ICS 6, Type 4, smooth sheet metal enclosure constructed in accordance with applicable requirements of UL 1066 and/or UL 1008. Metal gauge shall be not less than No. 14. Enclosure shall be equipped with at least two

approved grounding lugs for grounding enclosure to facility ground system using No. 4 AWG copper conductors. Factory wiring within enclosure and field wiring terminating within enclosure shall comply with NFPA 70. If wiring is not color coded, wire shall be permanently tagged or marked near terminal at each end with wire number shown on approved detail drawing. Terminal block shall conform to NEMA ICS 4. Terminals shall be arranged for entrance of external conductors from top and bottom of enclosure as shown. Main switch terminals, including neutral terminal if used, shall be pressure type suitable for termination of external conductors as shown.

2.3.1 Construction

Enclosure shall be constructed for ease of removal and replacement of ATS components and control devices from front without disconnection of external power conductors or removal or disassembly of major components. Enclosure of ATS with BP/IS shall be constructed to protect personnel from energized BP/IS components during ATS maintenance.

2.3.2 Cleaning and Painting

Both the inside and outside surfaces of an enclosure, including means for fastening, shall be protected against corrosion by enameling, galvanizing, plating, powder coating, or other equivalent means. Protection is not required for metal parts that are inherently resistant to corrosion, bearings, sliding surfaces of hinges, or other parts where such protection is impractical. Finish shall be manufacturer's standard material, process, and color and shall be free from runs, sags, peeling, or other defects. An enclosure marked Type 1, 3R, 4 or 12 shall be acceptable if there is no visible rust at the conclusion of a salt spray (fog) test using the test method in ASTM B 117, employing a 5 percent by weight, salt solution for 24 hours. Type 4X enclosures are acceptable following performance of the above test with an exposure time of 200 hours.

2.4 TESTING

2.4.1 Factory Testing

A prototype of specified ATS shall be factory tested in accordance with UL 1008. In addition, factory tests shall be performed on each ATS as follows:

a. Insulation resistance test to ensure integrity and continuity of entire system.

b. Main switch contact resistance test.

c. Visual inspection to verify that each ATS is as specified.

d. Mechanical test to verify that ATS sections are free of mechanical hindrances.

e. Electrical tests to verify complete system electrical operation and to set up time delays and voltage sensing settings.

2.4.2 Factory Test Reports

Manufacturer shall provide three certified copies of factory test reports.

2.5 FACTORY TESTING (MEDICAL FACILITIES)

The factory tests for ATS and By-Pass/Isolation switches used in medical facilities shall be conducted in the following sequence:

a. General
b. Normal
c. Overvoltage
d. Undervoltage
e. Overload
f. Endurance
g. Temperature Rise
h. Dielectric Voltage-Withstand
i. Contact Opening
j. Dielectric Voltage-Withstand (Repeated)
k. Withstand
l. Instrumentation and Calibration of High Capacity
m. Closing
n. Dielectric Voltage-Withstand (Repeated)
o. Strength of Insulating Base and Support

2.5.1 Viewing Ports

ATS and BP/IS switches shall be of draw-out construction. Viewing ports to inspect the contacts without requiring disassembly shall be provided.

2.5.2 Operating Handles

The operating handles shall be externally operated, and designed and constructed not to stop in an intermediate or neutral position during operation, but shall permit load by-pass and transfer switch isolation in no more than two manual operations which can be performed by one person in 5 seconds or less. The transfer speed will be independent of the operational speed of the switch handle or handles.

PART 3 EXECUTION

3.1 INSTALLATION

ATS shall be installed as shown and in accordance with approved manufacturer's instructions.

3.2 INSTRUCTIONS

Manufacturer's approved operating instructions shall be permanently secured to cabinet where operator can see them. One-line and elementary or schematic diagram shall be permanently secured to inside of front enclosure door.

3.3 SITE TESTING

Following completion of ATS installation and after making proper adjustments and settings, site tests shall be performed in accordance with manufacturer's written instructions to demonstrate that each ATS functions satisfactorily and as specified. Contractor shall advise Contracting Officer not less than 5 working days prior to scheduled date for site testing, and shall provide certified field test reports within 2 calendar weeks following successful completion of site tests. Test reports shall describe adjustments and settings made and site tests performed. Minimum operational tests shall include the following:

a. Insulation resistance shall be tested, both phase-to-phase and phase-to-ground.

b. Power failure of normal source shall be simulated by opening upstream protective device. This test shall be performed a minimum of five times.

c. Power failure of emergency source with normal source available shall be simulated by opening upstream protective device for emergency source. This test shall be performed a minimum of five times.

d. Low phase-to-ground voltage shall be simulated for each phase of normal source.

e. Operation and settings shall be verified for specified ATS features, such as override time delay, transfer time delay, return time delay, engine shutdown time delay, exerciser, auxiliary contacts, and supplemental features.

f. Manual and automatic ATS and BP/IS functions shall be verified.

-- End of Section --

ATTACHMENT 1

SWMU 6 SAMPLING RESULTS REPORT

RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

Prepared for:

USACE Baltimore District

Delivery Order No. 0018
Contract No. DACA31-00-D-0011

May 2001

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EXECUTIVE SUMMARY

URS/Dames & Moore (URS) conducted Soil Sampling and Reporting at Solid Waste Management Unit (SWMU) 6, Acid Wastewater Lagoon at the Radford Army Ammunition Plant (RFAAP), Radford, Virginia in accordance with Work Plan Addendum No. 11 as approved by USEPA Region III. This effort is critical for the Production Base Support (PBS) project to construct nitrocellulose (NC) settling tanks in an area that includes SWMU 6. It will allow RFAAP to properly manage the excavated material during construction and to prevent future sampling under the tanks once the construction is complete.

The specific objectives of the soil sampling and reporting at SWMU 6 were: (1) to collect and chemically analyze composite and discrete subsurface soil samples from overburden soils; (2) to perform an evaluation of the data with respect to RCRA hazardous waste characteristics; and (3) to provide data that can be used to evaluate residual risk through comparison to USEPA residential and industrial Region III Risk Based Concentrations (RBCs).

To achieve these objectives, twelve soil borings were advanced. One representative composite sample was collected from the overburden soil, and one representative discrete sample of the soils at depth from each of the twelve soil borings. The composite overburden samples were analyzed for full Toxicity Characteristics Leaching Procedure (TCLP) including TCLP metals, TCLP volatile organic compounds (VOCs), TCLP semi-volatile organic compounds (SVOCs), TCLP pesticides, and TCLP herbicides, plus corrosivity, reactivity (percent nitrocellulose), and paint filter liquids, in accordance with SW-846 Methods. Results were compared to the Regulatory TCLP limits for hazardous waste set forth in 40 CFR 261, to assess the appropriate disposal methods for soil excavated as part of the PBS project.

Discrete samples were collected below the planned excavation depth of 25-feet below ground surface (bgs), or at probe refusal (if less than 25-feet bgs). Each of the twelve discrete samples was analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-Volatile Organic Compounds (SVOCs), TCL pesticides/ aroclors, Target Analyte List (TAL) metals, and explosives following SW-846 Methods. Soil analytical results were compared to USEPA Region III Residential and Industrial RBC Tables to evaluate the residual risk of compounds detected in the discrete samples.

The results of the laboratory analysis indicate that several of the TCLP analytes (for evaluation of overburden soils as hazardous waste) were reported at values that are above the laboratory detection limits. However, none of the analytes detected exceeded the Regulatory TCLP limits for hazardous waste. Based on these results, the soil excavated as part of the construction project will likely not have to be disposed of as hazardous waste.

The results of the laboratory analysis indicate that several of the TAL/TCL analytes (for evaluation of discrete samples for residual risk) were reported at concentrations that are above the laboratory detection limits. Four (4) TCL VOCs, one (1) TCL SVOC, seven (7) TCL pesticide/PCBs, one (1) explosive and twenty-two (22) TAL metals were detected in the discrete samples. Of these detections, none of the TCL VOCs or SVOCs were present above the applicable RBC criteria. Detected TCL

Pesticides/PCBs and explosive concentrations were less than applicable RBC criteria. Aluminum (10,200 to 49,600 mg/Kg) detections were above the residential RBC of 7,800; however, these detections were below the industrial RBC of 200,000 mg/Kg. Arsenic detections (3.8 to 7.6 mg/Kg) were above the residential and industrial RBCs of 0.43 and 3.8 mg/kg, respectively. Chromium detections (18.6 to 51.5 mg/Kg) were above the residential RBC of (23 mg/kg); however, these detections were below the industrial RBC of 610 mg/kg. Iron detections (20,500 to 40,400 mg/Kg) were above the residential RBC of 2,300 mg/kg; however, these detections were below the industrial RBC of 61,000 mg/kg. Manganese detections (181 to 1,510 mg/Kg) were above the residential RBC of 160 mg/kg; however, these detections were below the industrial RBC of 4,100 mg/Kg. The thallium detection (1.2 mg/Kg) was above the residential RBC of 0.55 mg/kg; however, these detections were below the industrial RBC of 14 mg/Kg. Vanadium detections of greater than 55 to 89.9 mg/Kg were above the residential RBC of 55 mg/kg; however, these detections were below the industrial RBC of 1,400 mg/Kg.

1.0 INSTALLATION DESCRIPTION AND BACKGROUND

RFAAP is a government-owned, contractor-operated (GOCO) industrial complex located in Radford, Virginia. It is owned by the U.S. Department of the Army and was operated under contract with Hercules, Inc., from 1941 until 1995 when Alliant Techsystems (ATK) became the operating contractor. The installation consists of two noncontiguous areas: the Main Manufacturing Area (MMA) and the New River Unit (NRU). SWMU 6 is located in the MMA of RFAAP.

The MMA contains approximately 1,969 buildings and occupies 6,900 acres. Facility activities include the manufacturing of solid propellants used in small arms, anti-aircraft and anti-tank weapons, rockets, torpedoes, missile systems, igniters, gas generators, and related items.

2.1 LOCATION

The RFAAP MMA is located approximately 10 miles west of Blacksburg, Virginia and 47 miles southwest of Roanoke, Virginia (Figure 1). It lies in one of a series of narrow valleys typical of the Appalachian Mountain region. The valley is oriented in a northeast-southwest direction, and is approximately 25 miles long and 8 miles wide at the southwest end, narrowing to 2 miles at its northeast end.

SWMU 6 was historically used as an unlined surface impoundment (i.e., acidic wastewater lagoon). It is located approximately 2,000 feet northwest of the administration area (Figure 2). The lagoon is "tear-dropped" or "triangular" in shape. The boundaries of SWMU 6 were evaluated by reviewing aerial photographs of RFAAP for the period 1937 through 1986 (Figure 3). The earliest presence of SWMU 6 was observed in photographs from 1975 and was also apparent in photographs from 1981 and 1986. Changes in the appearance of SWMU 6 were not observed on the photographs in which it was visible. A copy of the 1986 aerial photograph, which shows the location and boundary of SWMU 6, is provided as Appendix A.

2.2 BACKGROUND INFORMATION

SWMU 6 was used from 1974 to 1980 as an unlined surface impoundment that received overflow and rinse waters from an acid storage tank area in the C-Line nitrocellulose (NC) manufacturing area. During its active life, SWMU 6 received wastewater that typically exhibited the characteristic of a corrosive liquid (RCRA hazardous waste characteristic code D002). There were no overflow controls at the lagoon.

Between 1980 and 1987, the C-Line NC manufacturing area was shut down and no wastewater was introduced to the lagoon. In 1987, the lagoon was filled with soil and replaced by a holding tank.

Dames & Moore (1992) conducted Verification Investigation (VI) sampling at SWMU 6 to assess whether soil contamination existed associated with acidic wastewater that was formerly discharged to the lagoon. Two boreholes (6SB1 and 6SB2) were drilled at SWMU 6 (Figure 4). Boring 6SB1 was advanced to a depth of 21.0 feet bgs in what was thought to be the deepest part of the former lagoon,

which would have likely contained wastewater over the longest time period. Dames & Moore did not observe indications of contamination. Dames & Moore collected two samples from this boring for chemical analysis at depths of 18.0 feet and 20.5 feet below ground surface (bgs). The samples were analyzed for Target Analyte List (TAL) metals and pH.

Dames & Moore drilled boring 6SB2 to a depth of 22.9 feet bgs in what was thought to be a shallower section of the former lagoon. Visual observations of the soil profile indicated the presence of a possible sludge-like material from 14.0 feet to 20.0 feet bgs. Dames & Moore collected two samples from this boring for chemical analysis, 6SB2A and 6SB2B, at depths of 14.0 and 22.0 feet bgs, respectively. The samples were analyzed for TAL metals and pH. Monitoring wells were not installed at SWMU 6 as part of the VI due to the uncertainty that wells would actually intercept groundwater flowing in the karst aquifer beneath the former lagoon area.

Nineteen (19) metals were detected in the four soil samples collected from the former wastewater lagoon. The sample data were compared to Health Based Numbers (HBNs), which were set forth in the installation's first RCRA permit, issued in 1989, which governed activities at the time. Soil sample concentrations of arsenic and cobalt exceeded the HBN criteria in the four samples. Thallium in one sample exceeded the soil HBN criterion in a duplicate analysis; however, the concentration was less than the Practical Quantitation Limit (PQL). No other metal concentrations exceeded HBN criteria.

3.0 ENVIRONMENTAL SETTING

3.1 TOPOGRAPHY

SWMU 6 is a flat grassy level area approximately 1,800 feet above mean sea level (msl), located between two upland ridges. To the north, the ridge rises approximately 6 feet; there are asphalt roads and buildings located on this ridge. The ridge to the south rises approximately 10 feet, where railroad tracks and an asphalt road are present. SWMU 6 is located within an industrial area composed of numerous buildings, overhead pipes, railroad tracks, and asphalt roads.

Based on topography, surface water runoff from these ridges on the northern and southern sides of the SWMU flows into the SWMU 6 area. Surface runoff within SWMU 6 likely flows into storm water catch basins located near the northeast and southeast ends of the SWMU.

3.2 GEOLOGY

The RFAAP is located in a region underlain by carbonate rocks (i.e., limestone and dolomite), and therefore, exhibits prominent karstic features including sinkholes, caves, and caverns. Karst landforms occur in carbonate rock formations as the result of the dissolution of rock by naturally occurring carbonic acid in rainwater.

According to previous studies (Dames & Moore, 1992), subsurface conditions observed in the vicinity of SWMU 6 consist of reddish-brown silty clay present in borings to bedrock or borehole termination. These residual deposits (clays and silts) are a result of chemical and physical weathering of the

underlying Elbrook Formation (limestone and dolomite). At RFAAP the depth to the Elbrook Formation ranges from 21 feet to greater than 45 feet (Dames & Moore, 1992).

3.3 SITE SOILS ENCOUNTERED - LITHOLOGIC DISCUSSION

During this field investigation, site soils encountered were similar to the soils described in previous investigations. Copies of the boring logs from this investigation are included as Appendix B. Figures 5 and 6 present cross-sections of soils encountered during the investigation. In general, soils encountered consisted of a thin surface layer of brown-to reddish-brown clayey silty fine sand, with organic matter and root material, which graded to red or strong brown fine sandy clay at approximately 0.5 feet bgs. From 0.5 feet bgs to depths ranging from 6.5 to 19.0 feet bgs, the soils consisted of red, dark yellowish brown or strong brown silty clay. This stratum is referred to as Stratum 1. Variations in sand and moisture content were observed, as well as plasticity in Stratum 1. In addition, variable amounts of gravel were present. In some borings, the sample recovery was limited at depths of 4.0 to 16.0 feet bgs. This was likely due to the presence of gravels, which prevented the soil from entering the sampling device.

Below Stratum 1, a gradational to sharp change to olive, grayish brown or dark- to very dark-gray silty clay/clayey silt was observed. This Stratum is referred to as Stratum 2. Stratum 2 is characterized by a distinct color change from the overlying soil and the presence small ($<$1 to 2 inches) pieces of wood chips and woody matter. Texturally, Stratum 2 ranged from soft silty clay (plastic) to sandy wet clay and silt mixtures, to stiff sandy plastic clay. Thin layers (1 to 2 inches) of sand were present in Stratum 2. It should be noted that the texture of Stratum 2 was consistent with that of a soil and did not appear to be sludge. Stratum 2 is therefore considered to be soil and is discussed as soil herein. The distinct color characteristics of Stratum 2 may be indicative of influence from former operations at the SWMU.

Below Stratum 2, the soil was generally stiff to hard silty clay, of medium to high plasticity, and varied in color from yellowish red to red to strong brown. This layer is identified as Stratum 3 in this report. Stratum 3 was observed to be the hardest of the three Strata and may act as a barrier to the downward movement of groundwater.

Geoprobe® refusal, or probe refusal, occurred in three boring locations at bedrock. Boring 6SB3 was terminated at a depth of 27.9 feet bgs. Boring 6SB5 was terminated at a depth of 17.4 feet bgs and boring 6SB10 was terminated at a depth of 20.4 feet bgs. The remainder of the borings were advanced to a depth of 27 feet bgs without probe refusal or indications of bedrock. The observed variations in depth to bedrock are typical of the carbonate rocks present in the region.

4.0 SUMMARY OF FIELD SAMPLING PROGRAM

The purpose of the SWMU 6 sampling program was to collect representative composite samples of the overburden soils and representative discrete samples of the soil at depth (25-feet bgs or at probe refusal) in twelve soil borings advanced in SWMU 6. Each of the twelve composite samples submitted to the laboratory was analyzed for full Toxicity Characteristic Leaching Procedure (TCLP) analysis

including TCLP metals, TCLP VOCs, TCLP SVOCs, TCLP pesticides, and TCLP herbicides, plus ignitability, corrosivity, reactivity (percent nitrocellulose) and paint filter liquids according to SW-846 Method protocols. Each of the 12 discrete samples was analyzed for SW-846 Methods: target compound list (TCL) VOCs; TCL semi-volatile organic compounds; TCL pesticides/aroclors; target analyte list (TAL), metals and explosives.

Figure 7 shows the locations of the 12 soil borings, and Figure 8 shows the approximate locations where the settling tanks will be placed relative to SWMU 6. In selecting the locations of subsurface soil samples to be collected, consideration was given to the size and shape of SWMU 6, as well as the overall project objective of evaluating the overburden soils relative to RCRA waste characteristics and providing the information necessary for evaluating the soils at depth relative to USEPA Region III residential and industrial RBCs.

The investigation activities were conducted in accordance with the EPA approved Work Plan Addendum No. 11.

Components of the investigation included subsurface soil sampling and sample collection by direct push technology (Geoprobe®) methods, boring abandonment, stratigraphic logging of the soil borings, sample management, field screening using a portable photoionization detector (PID), field documentation, laboratory analysis, quality assurance practices, and evaluation of the data relative to RCRA hazardous waste characteristics and USEPA Region III residential and industrial RBCs.

4.1 GEOPROBE® SAMPLING

During WPA development and subsequent USEPA concurrence, the number and locations of soil borings was deemed sufficient to provide an appropriate number of samples to: (1) characterize the volume of soil that will ultimately be excavated from SWMU 6; and (2) evaluate the residual risk, if applicable, of soil that will remain at depth. Given the objectives of the sampling program and the planned excavation of a significant portion of the SWMU 6 area, a distribution of 12 soil borings that provides adequate coverage of the SWMU area and allows for the collection of an appropriate number of samples to characterize soils within the SWMU 6 area was selected. Table 1 provides a summary of the samples collected from each boring. Samples collected for “Overburden Characterization” were composite samples while samples collected for “Residual Risk Screening” were discrete samples.

Boring logs, with information including lithology, boring depth, sample depth, and PID screenings are included in Appendix B. In addition to selecting borings locations that provided geographic coverage of the interior of the SWMU 6 area, borings were placed along the SWMU edges (and in some cases outside the boundaries of the SWMU) to evaluate the potential that constituents may have “leaked” beyond the boundaries of the SWMU.

Prior to the start of the investigation, a meeting was held at the SWMU 6 area to discuss the selected soil boring locations (which were flagged within the SWMU), and to evaluate the locations of underground utilities. Personnel present during this meeting represented RFAAP, URS, USACE and ATK. USACE personnel reviewed utility maps and marked potential underground utilities prior to

drilling. Subsequently, the proposed boring locations were modified (as flagged in the field and identified in the work plan for this investigation) in the field, based on the identification of the locations of potential underground utilities during this meeting. The approximate locations of underground utilities present at SWMU 6 are shown on Figure 9.

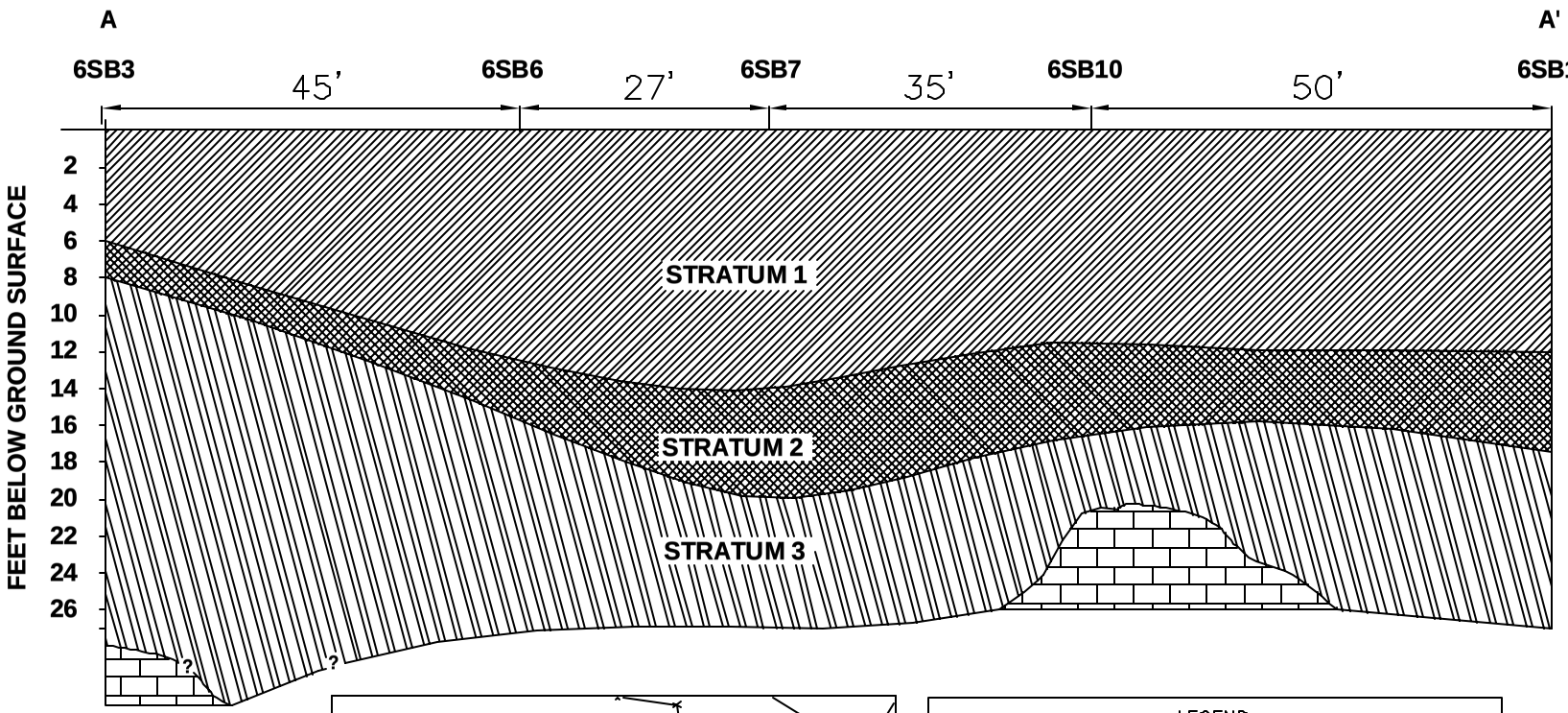
Figure 10 depicts the actual soil boring locations, versus the proposed boring locations identified in the WPA. As shown on Figure 10, borings 6SB3, 6SB5, 6SB9, and 6SB12 were offset to the south. One additional boring was re-positioned from the northern boundary to nearer the center of the SWMU (6SB6). Boring 6SB13 was offset to the east due to the presence of utilities. Boring 6SB12 was offset to the west slightly and boring 6SB10 was offset to the south due to the presence of utilities.

The Geoprobe® is a "direct push" technique, which incorporates a hydraulically powered percussion/probing machine designed specifically for use in the environmental industry. The Geoprobe® uses static force (the truck's weight) and a percussion hammer to advance small diameter sampling tools into the subsurface to collect soil cores. The macro soil core sample is collected inside a dedicated, pre-cleaned acetate liner; each acetate liner is used once, then discarded (handled as IDM).

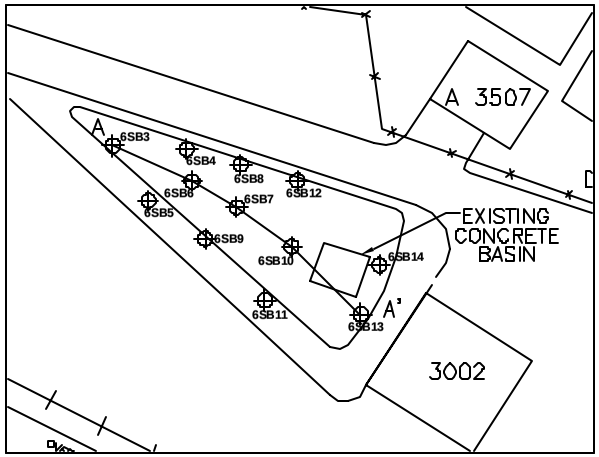
Soil borings were advanced using the direct push technology. A four-foot Macro-Core® device was used to collect the samples. Stratigraphic logs for each boring were prepared. During drilling, subsurface soil samples were screened for the presence of organic compounds using a PID. The PID was calibrated against a 100 ppm isobutylene standard calibration gas (since a single VOC constituent of concern was not previously identified) using a 10.2 eV lamp.

The Geoprobe® and other down hole equipment and tools were steam cleaned daily prior to use at the site. The down-hole equipment and tools were decontaminated on site between each boring location. Following each soil sampling interval (i.e., 4-foot section), the Macro-Core®-cutting shoe (the end of the Macro-Core® that comes in contact with the soil) was decontaminated in accordance with the WPA. Decontamination water was containerized on site.

Soil borings were abandoned (sealed) upon completion by pouring bentonite chips into the borehole in accordance with the WPA. In accordance with the WPA, the chips were not hydrated because the borings were less than three inches in diameter.



Scale
V: 1"=10'
H: 1"=20'
VE: 2x



Inset Scale 0 100 Feet

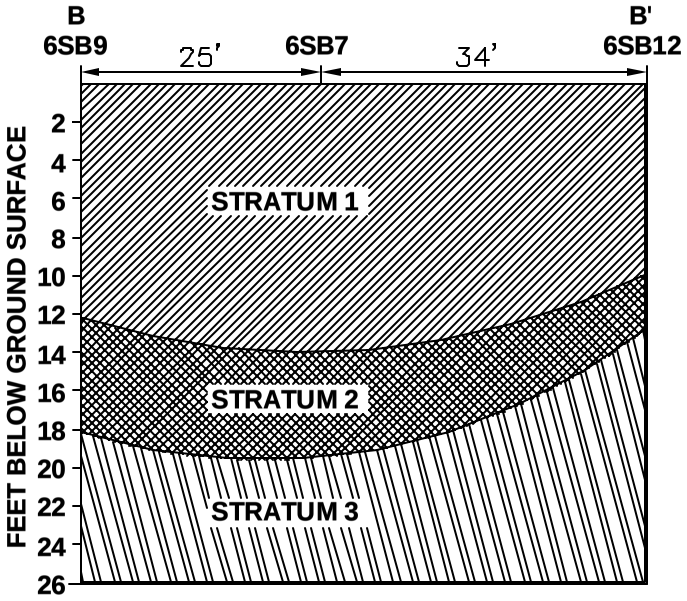
LEGEND

Layer 1 Red, dark yellowish brown or strong brown silty clay.

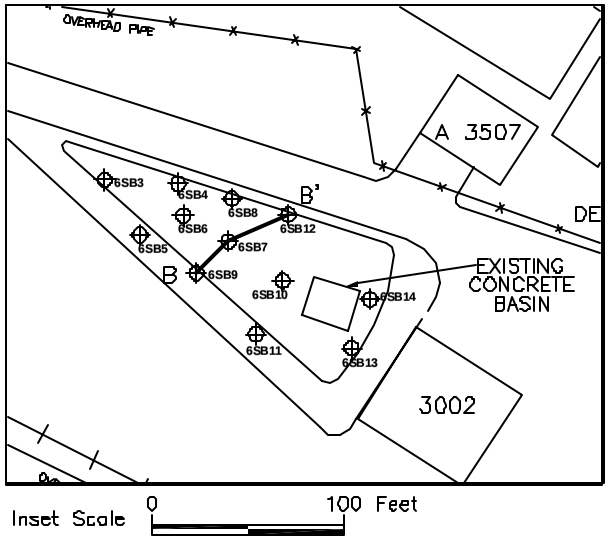
Layer 2 Olive, grayish brown, or dark gray silt and clay mixtures or silty clay mixtures often with the presence of woody matter.

Layer 3 Yellowish red, red to strong brown, stiff to hard plastic silty clay.

Radford Army Ammunition Plant (RFAAP) SWMU 6 Sampling Results Report	
Figure 5	Date/Drawing No. 09604.242.F5.DWG
SWMU 6 Interpreted Cross Section A to A'	Scale: As Shown



Scale
V: 1"=5'
H: 1"=10'
VE: 2x



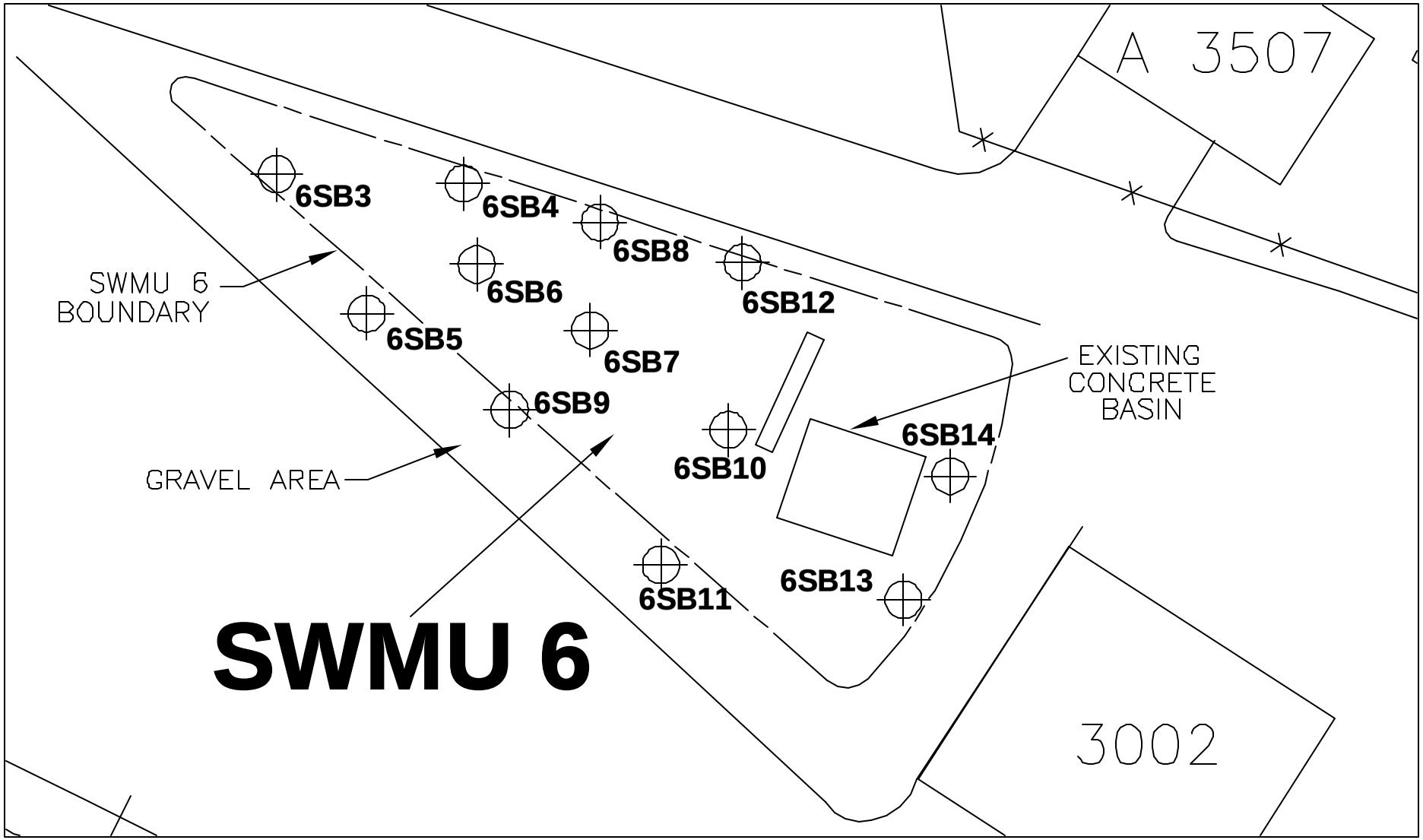
LEGEND

Layer 1 Red, dark yellowish brown or strong brown silty clay.

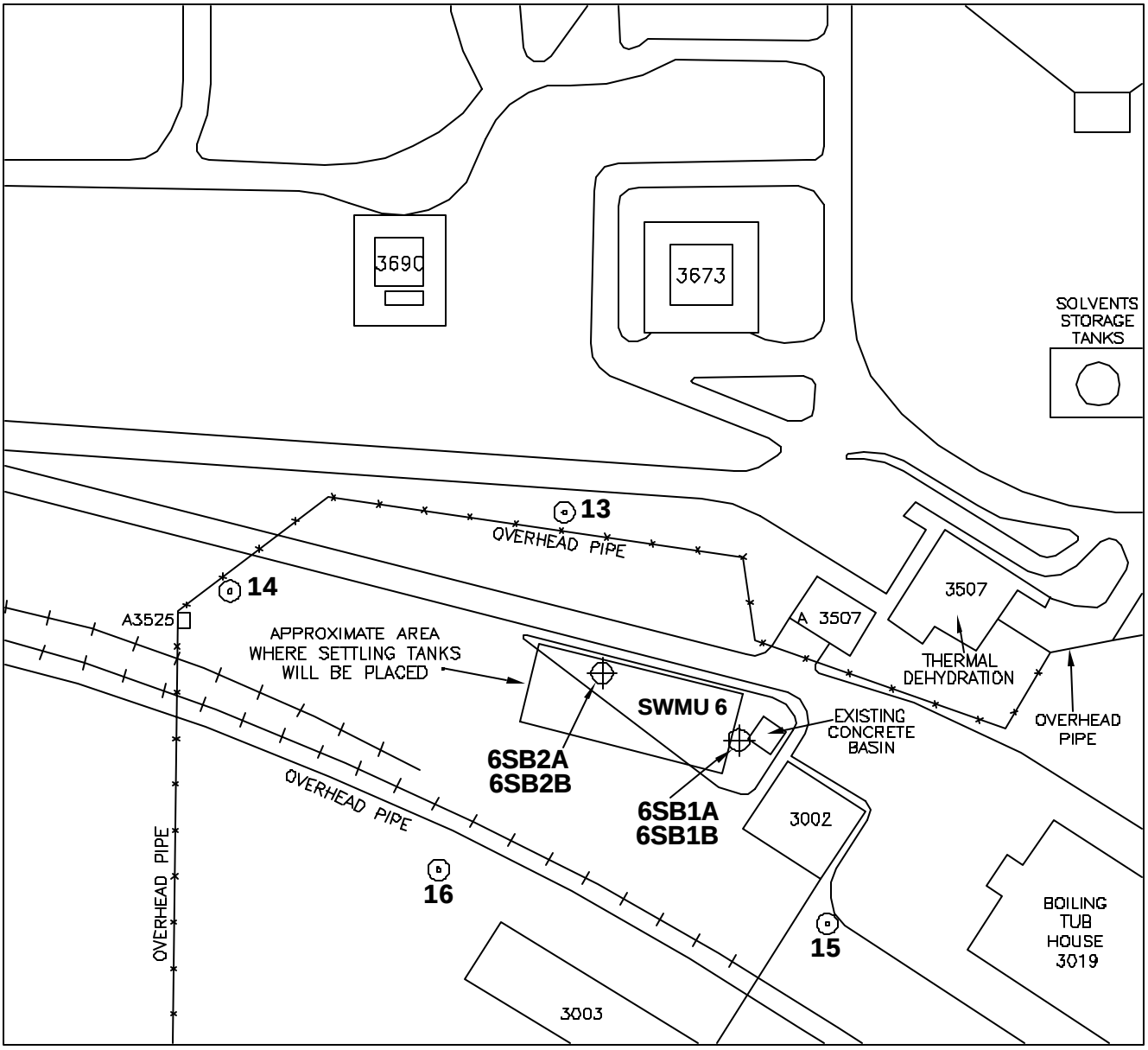
Layer 2 Olive, grayish brown, or dark gray silt and clay mixtures or silty clay mixtures often with the presence of woody matter.

Layer 3 Yellowish red, red to strong brown, stiff to hard plastic silty clay.

Radford Army Ammunition Plant (RFAAP) SWMU 6 Sampling Results Report	
Figure 6	Date/Drawing No. 09604.242.F6.DWG
SWMU 6 Interpreted Cross Section B to B'	Scale: As Shown



Radford Army Ammunition Plant (RFAAP) SWMU 6 Sampling Results Report	
Figure 7	Date/Drawing. No. 09604.242.F7.DWG
SWMU 6 Boring Locations	Scale: As Shown



LEGEND:

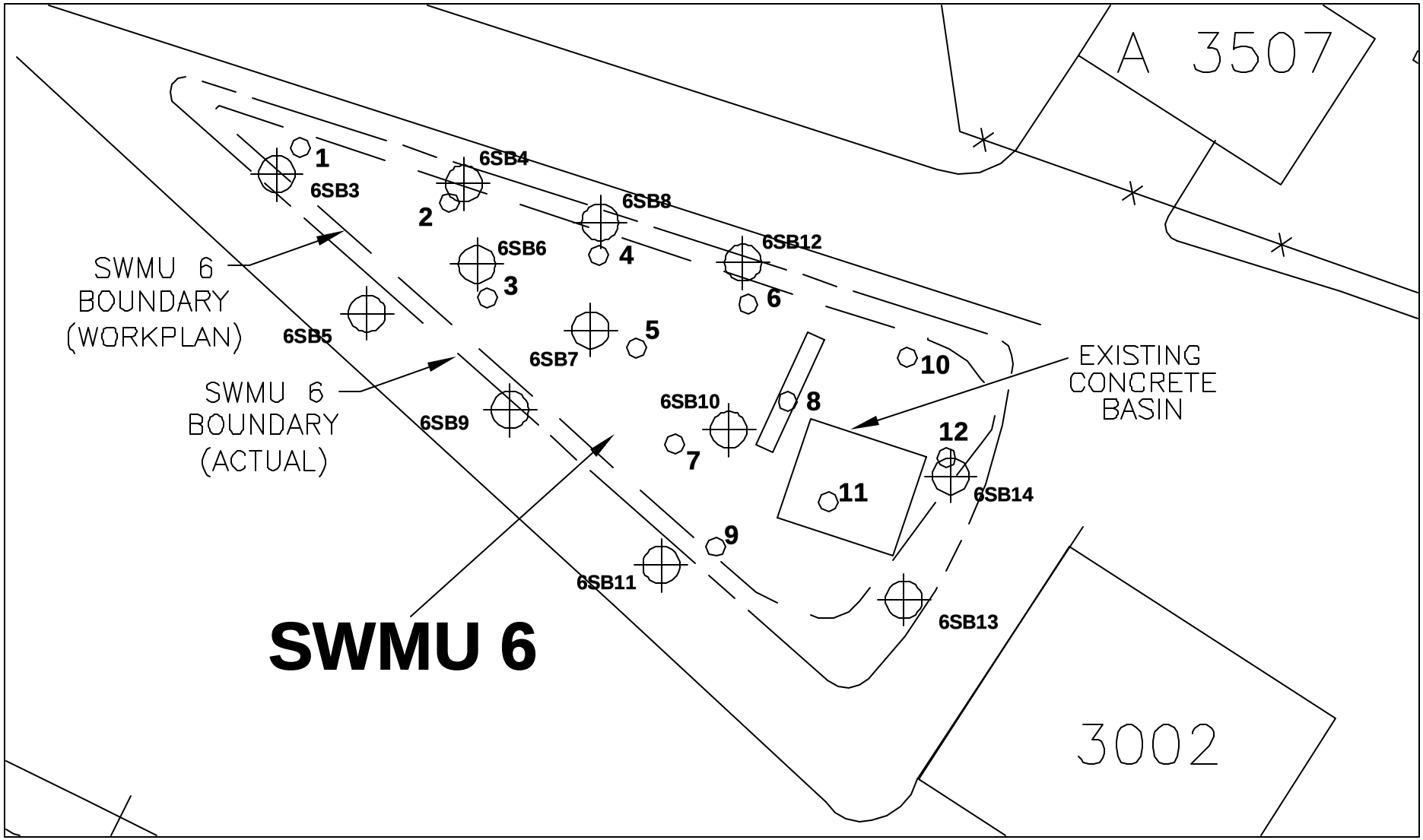
- Existing Boring
- Existing Monitoring Well/Boring

N

0 100 Feet

APPROXIMATE SCALE

Radford Army Ammunition Plant (RFAAP) SWMU 6 Sampling Results Report	
Figure 8	Date/Drawing. No. 09604.242.F8.DWG
Approximate Area Where Settling Tanks Will Be Placed	Scale: As Shown



Radford Army Ammunition Plant (RFAAP) SWMU 6 Sampling Results Report	
Figure 10	Data/Drawing. No. 09604.242.F10.DWG
SWMU 6 Proposed versus actual Boring Locations	Scale As Shown

URS Dames & Moore

Log of:	**6SB3**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth: **27.9'**	**Elev GS:** **Reference:**	**Date:** **Start: 11/14/00**	**Complete: 11/14/2000**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' /			0-4'	2	CL	Brown organics/roots/fine sandy clay
ND	/ 4.0'						0.5': Dark red, (2.5y 3/6), fine sandy clay, moist, low plasticity, trace gravels.
ND							
ND							2.5': Dark yellowish brown, (10 yr 5/6), silty clay, moist,medium plasticity some red and black mottling.
ND	4.0' /			4-8'	4		
ND	/ 4.0'				6		4.0': Grading yellowish brown (10 yr 5/6), silty clay, wet, moist, trace gravels
ND							
ND							6.5': Olive, (2.5 yr 5/4), silty clay, trace gravels
ND	4.0' /			8-12'	8	CL	8.0': Reddish yellow (7.5 yr 6/8) silty clay, moist, root material AT 10.9'
0.1	/ 2.2'				10		
4.0	4.0' /			12-16'	12		12.0': Reddish yellow, (7.5 yr 6/8), silty clay, moist, high plasticity
6.0	/ 1.2'				14		
7.0	4.0' / 1.0'			16-20'	16		Increased sand component
					18		
					20		
ND	4.0' /			20-24'	22		
ND	/ 0.8'						Increased resistance, hard, at 23'
ND					24		
ND	3.9' /			24-27.9'	26		
ND	/ 3.5'						
							27.9': Boring terminated at 27.9'. Refusal.

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB4**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**27.0'** **Elev GS:** **Reference:**	**Date: Start: 11/14/00**	**Complete: 11/14/2000**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 3.4'			0-4'	2	SM	Brown root matter, grading to reddish brown, (2.5 yr 3/3), medium grained clayey sand, slightly micaceous, moist, grading red.
						CL	
						GW	Gravel layer
	4.0' / 2.8'			4-8'	4		Strong brown, (7.5 yr 5/6), medium to coarse sandy clay, soft, high plasticity, moist
					6		
	4.0' / 1.0'			8-12'	8		
					10	CL	Gravel lenses
	4.0' / 3.4'			12-16'	12		
					14		Grading softer, increase in moisture
					16		Grayish brown, (2.5 yr 5/2), stiff, sandy clay, low plasticity, wet
	4.0' / 4.0'			16-20'	18		
						SM	18.5': Silt/very fine sand mix
							18.7': Yellowish red, (5 yr 5/6) stiff, fine sandy clay, wet with black matter (coal?)
	4.0' / 4.0'			20-24'	20		
					22	CL	
	3.0' / 3.0'			24-27'	24		
					26		
							Boring terminated at 27' - No refusal.

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB5**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**17.4** **Elev GS:** **Reference:**	**Date: Start: 11/15/00**	**Complete: 11/15/2000**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2		Brownish red, sandy clay, stiff Strong brown, (7.5 yr 5/6), silty clay, stiff, moist
	4.0' / 4.0'			4-8'	4		Grading moist with moderate plasticity
	4.0' / 4.0'				6		Trace black matter (coal?). Trace fine to coarse sand, trace fine gravels
	4.0' / 3.0'			8-12'	8	CL	Grading redder; hard at 7.9' Red (2.5 yr 4/6) fine to medium sandy clay, moist, grading with soft sandy clay
	4.0' / 0.5'			12-16'	10		
	1.4' / 1.0'				12		
					14		
					16		Grading strong brown, soft sandy clay
				16-17.4'	18		Boring terminated at 17.4'. Refusal
				20-24'	20		
					22		
				24-27'	24		
					26		

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB6**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**27.0'** **Elev GS:** **Reference:**	**Date: Start: 11/15/00**	**Complete: 11/15/2000**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2	SC	Brown sandy clay, roots, grass Red, (2.5 yr 4/8), fine to medium sandy clay, moist
	4.0' / 4.0'			4-8'	4 6	CL	5.6' to 5.9': Gravel seam, with strong brown mottlling, moist
	4.0' / 0.8'			8-12'	8 10	CL/GP	8.0' to 12.0': Red gravelly clay,
	4.0' / 2.0'			12-16'	12 14	CL/ML	Strong brown (10 yr 5/6), clayey silt to silty clay, wet with trace gravel in lenses 15.5': Very dark gray soft silty clay
	4.0' / 3.0'			16-20'	16 18	CL	Dark brown, (10 yr 4/2), silty sandy clay, very stiff, moist
	4.0' / 4.0'			20-24'	20 22		Grading softer, wet, with gravel
	4.0' / 3.0'			24-27'	24 26		Increasing sand, wet
							Boring terminated at 27'. No refusal.

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB7**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth: **27.0'**	**Elev GS:** **Reference:**	**Date: Start: 11/14/00**	**Complete: 11/14/2000**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2	SM	Brown silty sandy clay with organics Red (2.5 yr 4/8) fine to medium sandy clay, slightly micaceous, trace coarse sand , moist
					4		Red (2.5 yr 4/8) sandy clay, slightly plastic, moist
	4.0' / 4.0'			4-8'	6	CL	Grading stiffer; trace gravels, trace yellow mottles; moist
					8		Increased gravels
0.2	4.0' / 4.0'			8-12'	10		10.0' to 10.8': Increased moisture and plasticity, soft
ND						CH	10.8': Brownish yellow (10 yr 6/6) soft, highly plastic clay trace coarse sand, moist
	4.0' / 3.4'			12-16'	12		
					14		Grades to light olive brown (2.5 yr 5/3) soft, clay and silt, wet, with trace decomposed wood fragments
	4.0' / 4.0'			16-20'	16	CL	
					18		
	4.0' / 4.0'			20-24'	20	CL	20.0': Strong brown (7.5 yr 5/3) soft silty clay, some sand, moist and gravel, moist
					22	CL/ML	21.0': Becomes brown (10 yr 5/3) soft, silty clay, some sand and gravel moist
					24		
	4.0' / 3.0'			24-27'	26	CL	Red sandy clay, moist
							Boring terminated at 27'. No refusal.

Note:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB8**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth: **27.0'**	**Elev GS:** **Reference:**	**Date: Start: 11/15/00**	**Complete: 11/15/2000**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2		Red sandy clay, with grass and roots, micaceous, stiff
							Reddish yellow (7.5 yr 6/6) silty clay, moist grading harder with depth, trace rounded gravels
	4.0' / 4.0'			4-8'	4		
					6	CL	6.0': Increased moisture with wood chips
	4.0' / 2.0'			8-12'	8		8.0' to 15.5': No wood chips
					10		
					12		12.4': Dark grayish brown (10 yr 4/2) soft, sandy clay, plastic, moist
	4.0' / 4.0'			12-16'	14	CL/CH	13.7': Stiffer
							15.5': Wood chips present with yellowish brown mottles, increasing sand and moisture
	4.0' / 4.0'			16-20'	16		
						GW	Gravel seam
					18		Yellowish red (5 yr 5/6) clay, very stiff to hard, moist, trace fine black matter (coal?)
	4.0' / 4.0'			20-24'	20		
					22	CL/CH	
	3.0' / 3.0'			24-27'	24		
					26		
							Boring terminated at 27'. No refusal.

Note:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

		Log of:	**6SB9**
		Project Number:	**09604-242**
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**27.0'** **Elev GS:** **Reference:**	**Date: Start:**	**11/15/00** **Complete: 11/15/00**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2	GM	Silty gravels to 0.3'
						CL	Red (2.5 yr 4/6) sandy clay, medium plasticity
							Yellowish brown (10 yr 5/8) soft clayey silt/silty clay, moist
	4.0' / 0.5'			4-8'	4	CL	4.8': Gravel seam
					6		
	4.0' / 2.3'			8-12'	8		Very soft yellowish brown silty clay, moist
					10	CL	
	4.0' / 1.0'			12-16'	12		Strong brown (7.5 yr 5/6) very soft, silty clay, low plasticity trace fine sand, wet
					14		
	4.0' / 4.0'			16-20'	16		
					18		18.0': Brown (7.5 yr 4/4)
							19.0': Brown (7.5 yr 4/4) stiff, sandy plastic clay with wood fragments
	4.0' / 4.0'			20-24'	20	CH	
					22		22.5' to 22.8': Zone of wood fragments, underlain by brown (7.5 yr 4/4) fine to medium clayey sand, trace rounded gravels
						SC	
	3.0' / 4.0'			24-27'	24	ML	24.0' to 27.0': Brown (7.5 yr 4/4) sandy clayey silt, saturated
					26		
							Boring terminated at 27'. No refusal.

Note:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB10**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth: **20.4'**	**Elev GS:** **Reference:**	**Date: Start: 11/15/00**	**Complete: 11/15/00**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0'			0-4'	2	SC	Brown silty clayey sand, grass and roots
ND	4.0'						Red, (2.5y 4/6), sandy clay, trace gravels, with yellowish brown mottles, moist
ND					4		
ND	4.0'			4-8'		CL	Red, (2.5y 4/6), sandy clay, trace gravels, with yellowish brown mottles; moist
0.2					6		
ND	4.0'						
ND				8-12'	8		
ND	4.0'						Grading stiffer.
0.1					10		
ND	4.0'						11.0': Yellowish brown, (10 yr 5/4), hard gravelly clay, trace wood fragments, moist
ND					12	CL/GP	
0.6				12-16'			
ND	4.0'				14	CL	13.5': Brown, (7.5 yr 5/3), sandy clay with some red mottling.
ND							
ND						SM	15.2': Brown, (7.5 yr 5/3), soft silty sand, with wood fragments
ND	4.0'				16		16.0': Yellowish brown, (10 yr 5/6), hard sandy clay, moist
ND				16-20'		CL	
ND					18		
ND	4.0'						Grading to reddish brown, clayey silty fine sand, moist
ND	0.4' 0.4'				20	SC	Boring terminated at 20.4'. Refusal.
				20-24'	22		
					24		
				24-27'	26		

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB11**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**27.0'** **Elev GS:** **Reference:**	**Date: Start: 11/15/00**	**Complete: 11/15/00**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0'			0-4'	2	SC	Reddish brown, (2.5 yr 3/4), clayey silty sand becoming red (2.5 yr 4/8) softer, plastic sandy clay
ND						CL	1.5': Becomes brownish yellow, (10 yr 6/8), silty sandy clay, moist with strong brown, (7.5 yr 5/6), mottling, plasticity increasing.
ND							
ND	4.0'				4		
ND				4-8'		GC	5.0' - 5.5': Gravel lense
ND					6	CH	Highly plastic brownish yellow, (10 yr 6/8), clay; moist, trace sand, trace black matter (coal?)
ND	3.0'						
ND	4.0'				8		
ND				8-12'			
ND					10		
ND	4.0'					CL	10.5': Becomes reddish brown, (5 yr 4/6), soft fine to medium sandy silty clay, trace gravel, moist
ND					12	SM	11.5': Dark brown (7.5 yr 3/3) silty sand, moist, with root material
ND	4.0'						
0.1'	3.5'			12-16'	14	CL	14.2': Dark grayish brown, (2.5 yr 4/2), sandy clay, plastic, trace gravel, trace dark yellow brown, sandy clay, moist
ND							
ND					16		grading softer with gray and red mottles
ND	4.0'			16-20'			
ND					18		Brownish yellow, (10 yr 6/8), hard silty clayey gravelly sand, red mottles, moist
ND	4.0'					SP	
ND					20		
ND	4.0'			20-24'			
ND					22		
ND	4.0'					GC	Brownish yellow, (10 yr 6/8), clayey sandy gravel, moist
ND					24		
ND	3.0'			24-27'		CL	Strong brown, (7.5 yr 5/6), slightly sandy clay, plastic, moist, trace black matter (coal?)
ND					26		
							Boring terminated at 27' - No refusal.

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

		Log of:	**6SB12**
		Project Number:	**09604-242**
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**27.0'** **Elev GS:** **Reference:**	**Date: Start:**	**11/15/00** **Complete: 11/15/00**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2, 4	CL	Grass and root matter, becoming red (2.5 yr 4/6) hard sandy clay, 1.5' - 3.0' Micaceous sandy clay with gravel lense, moist
	4.0' / 2.8'			4-8'	6	ML	Yellow (10 yr 8/8) soft silt, dry
	4.0' / 1.5'			8-12'	8, 10	CL	7.0': Yellowish red (5 yr 5/6) sandy clay, soft, plastic, moist
	4.0' / 1.5'			12-16'	12, 14		13.0': Stiff dark brown (7.5 yr 4/3) fine to coarse sandy clay, moist
	4.0' / 4.0'			16-20'	16, 18		grading redder and gravelly
						GC	18.7' to 19.1': Sandy clayey gravel
	4.0' / 4.0'			20-24'	20, 22	CM	Yellowish red (5 yr 5/8) highly plastic stiff clay with strong brown and yellow mottles , moist
	4.0' / 3.0'			24-27'	24, 26	CL	Yellowish red (5 yr 5/8) medium stiff silty clay, trace sand lenses moist
							Boring terminated at 27'. No refusal.

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB13**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**27.0'** **Elev GS:** **Reference:**	**Date: Start: 11/16/00**	**Complete: 11/16/00**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2	GM	0' to 1.0': Surface gravel
						CL	1.0': Red (2.5 yr 4/6) clay, soft sandy (micaceous) silty, moist
	4.0' / 0.4'			4-8'	4		
					6		
	4.0' / 2.0'			8-12'	8	GC	8.4' to 8.7' Gravel lense
						CL	*8.7' to 8.8': Black tar-like matter with fiber-like matting attached to it (Resembles tar/matting of adjacent concrete basins) 8.8' to 12.0': Red clay, trace gravel, moist
					10		
	4.0' / 3.5'			12-16'	12	SP	Dark grayish brown (2.5 yr 4/2) clayey silty fine sand, moist
					14		
					16		Grades to soft silty clay
	4.0' / 4.0'			16-20'		CL	
					18		17.4': Yellowish brown (7.5 yr 5/4) soft, very silty clay, saturated
						SC	18.5' to 20.0': Strong brown (7.5 yr 5/8) soft sandy clay with fine gravel moist
	4.0' / 4.0'			20-24'	20		
					22		Strong brown (7.5 yr 5/8) gravelly sandy plastic clay, trace silt moist
					24	CL/GP	
	3.0' / 3.0'			24-27'	26		Increased plasticity
							Boring terminated at 27'. No refusal.

Notes:
ND = Not Detected
PID = Photo Ionization Detector

URS Dames & Moore

Log of:	**6SB14**		
Project Number:	**09604-242**		
Client:	**U.S. Army Corps of Engineers**	**Drilling Company:**	**Marshall Miller & Assoc.**
Project:	**SWMU 6 Sampling and Reporting**	**Driller:**	**Keith Carr**
Location:	**Radford Army Ammunition Plant, Radford, VA**	**Boring Method:**	**Geoprobe**
North:	**East:**	**Logged by:**	**John H. Spangler**
Total Depth:	**27.0'** **Elev GS:** **Reference:**	**Date: Start: 11/16/00**	**Complete: 11/16/00**

PID	Ft. Driven / Ft. Recovered	Composite Sample Collection Depth	VOC Sample Depth	Sample Interval	Depth (Ft.)	Symbol	Description
ND	4.0' / 4.0'			0-4'	2	GM	Surface gravel/silt/clay 0.75': Red (2.5 yr 4/6) sandy clay, medium plasticity, with yellowish brown mottling, moist
	4.0' / 0.3'			4-8'	4 6 8	CL	4.0': Increasing yellowish brown mottles
	4.0' / 3.2'			8-12'	10	GM	9.3' to 9.5': Gravel lense 9.5' to 10.0': Stiff red (2.5 yr 4/6) sandy clay, moist 10.0' - 12.0': Grading soft , with increasing gravels
	4.0' / 4.0'			12-16'	12 14	CL	
	4.0' / 4.0'			16-20'	16 18	SC/SM	14.7': Olive brown (2.5 yr 4/3) silty, trace clay, clayey fine sand, with occassional wood fragments, moist
	4.0' / 4.0'			20-24'	20 22	CH	Grading to dark brown (10 yr 4/3), trace wood fragments or sticks 21.5': Strong brown (7.5 yr 5/6) highly plastic clay, trace reddish yellow mottles
	3.0' / 3.0'			24-27'	24 26	CL	23.0': Strong brown (7.5 yr 5/6) slightly silty, slightly gravelly clay occasional reddish yellow mottles.
							Boring terminated at 27' - No probe refusal.

Notes:
ND = Not Detected
PID = Photo Ionization Detector

DACA65
CONTRACTING OFFICE (CA/CW)
US ARMY ENGR DIST NORFOLK ATTN:
CENAO-CT 803 FRONT STREET
NORFOLK VA 23510-1096

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

AMENDMENT/MODIFICATION NO.0001

SPECIFICATIONS

1. Section 09900: PAINTING, GENERAL, Page 6, Paragraph 3.2.1, in the third sentence after the wording "8 to 10 mils DFT layer of Fluorolast SB" add the following Fluorolast Product number and color "LCGY-8130AK (gray)".
2. Section 05090: WELDING, STRUCTURAL AND ACID PIPING change title to WELDING, STRUCTURAL.
3. Section 05093a: New Section, WELDING PRESSURE PIPING AND ACID GRAVITY PIPING with ATTACHMENT I.
4. Section 11211 PUMPS: INDUSTRIAL, CENTRIFUGAL: Replace pump section in its entirety.
5. Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS: Add Attachment 1, "BORINGS FROM SWMU 6 SOIL SAMPLING INVESTIGATION". This is for information only and are borings taken during the May 2001 SWMU (Solid Waste Management Unit) #6 Sampling Investigation for hazardous soils. Included is the EXECUTIVE SUMMARY from this investigation that indicated that no hazardous materials were found.
6. Section 01006 PROJECT WORK REQUIREMENTS AND RESTRICTIONS for RAAP, Paragraph 1.5.2 Rail Service add the following:

   "Contractor is made aware of safety work stoppages due to tanker unloading in the area of the project. The best ATK prediction of frequency and duration of solvent rail car unloading at bldg 3525, based on the last 1-2 years' production.
   - 2 ether cars per month.
   - 1 acetone car per year.
   - 7 or 8 alcohol cars per year.

   Each car takes approximately 2-3 hours to unload, and unloading is done during weekdays when the foreman is present. Ether, alcohol, and acetone, and rail cars are unloaded at approximately 33 cars per year, 2-3 hours each; and sometimes up to 6 cars per month depending on increased production."

   Therefore, Contractor personnel will be required to vacate site for solvent unloading 2-4 hours/week.

7. Section 01006 PROJECT WORK REQUIREMENTS AND RESTRICTIONS for RAAP,

Paragraph 1.5.1 Use of Roads Within the Facility add the following:
Contractor has been given approval by ATK to request road closure associated with excavation for construction of Haz Waste Tanks, subject to the following:

- Access to transformer substation north of location of road closing is maintained.
- Road closure does not extend beyond the following points:
  1. At the east solvent unloading gate (NW of Pump Tank 3054).
  2. Approximately 25-30 feet west of the west end of the new 3056 structure.

- Contractor shall provide a level turnaround area loop with an all-weather surface for a standard 18 wheel road tractor and tank semi-trailer to enter, unload, and exit the station 3525 area from the west road access without backing up.

The closure approval is effective only for excavation safety. After concrete structure can be backfilled, road must be re-opened. Contractor must backfill when structure progress permits and not leave the north side excavation opened an excuse to continue to block the road for his convenience."

8. Section 02080, Paragraph 1.4.1, Description of Work, change the first sentence as indicated in the amended spec.
9. Section 02732, PIPE REHABILITATION BY CURED-IN-PLACE METHOD. Section has been deleted in its entirety.
10. Section 01451A, CONTRACTOR QUALITY CONTROL, Paragraph 3.4.3 CQC Personnel, Item b, delete the term "fiberglass".
11. Section 16262, AUTOMATIC TRANSFER SWITCH AND BY-PASS/ISOLATION SWITCH. Add new section.
12. Section 15400, SECTION TABLE OF CONTENTS for PLUMBING, GENERAL PURPOSE was inadvertently inserted before Section 15250 Table of Contents. Reinsert the two pages of TOC to Section 15400.
13. Section 15200A, PIPELINES, PROCESS PIPING. Change all references from 304L stainless steel to 316L stainless steel, "Standard Weight".
14. Section 15200A, PIPELINES, PROCESS PIPING, Paragraph 2.6.2, Valve Schedule. Replace Valve/operator schedule paragraph with the following:

    "All valves for acidic waste and NC process water (35P and 156L):
    Gate, butterfly and check valve.
    The following standard:
    ANSI Std. B16.34
    Pressure Class 150#
    Body material ASTM 351-CF3M"

Extension stem floor stand and hand wheel should be provided as indicated on the drwgs.